Metals Review
THE NEWS DIGEST MAGAZINE

Volume XXIV - No. 4 April, 1951

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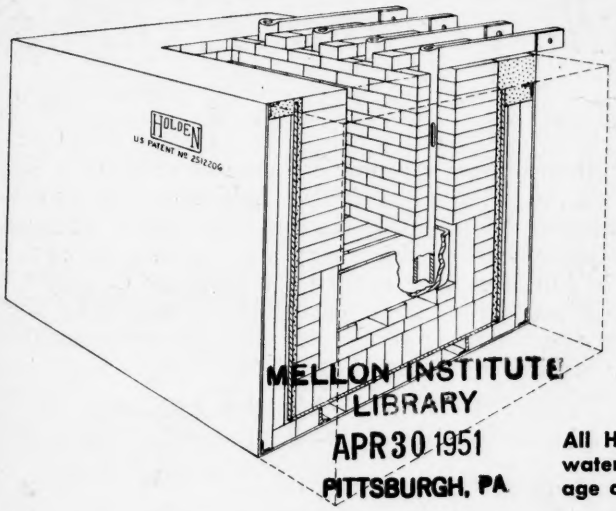

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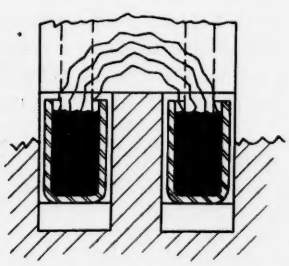

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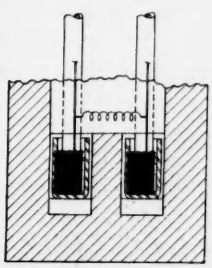

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Send Entries (BEFORE JUNE 1, 1951) to

METALLOGRAPHIC EXHIBIT—*Student Division*

7301 Euclid Avenue • Cleveland 3, Ohio

Metals Review

THE NEWS DIGEST MAGAZINE

VOLUME XXIV, No. 4 APRIL, 1951

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CONTENTS

NEWS

First World Metallurgical Congress to Be Held Next Fall 5
Akron Breaks Own Record With Educational Course 8
Mauthe to Receive McFarland Award 9
Panel Discussions Cover Heat Treatment 9
Metallurgical Advisory Board Starts Work 10
Course on Practical Metallurgy in Spokane 11
Metal Progress Adds Two to Sales Staff 18

IMPORTANT LECTURES

Welding Research 7
Finn Jonassen
Economies in Steelmaking 8
Harry McQuaid
Modern Theory of Elasticity 10
J. A. Sauer
Iron Ore Potentialities of South America 12
John V. Beall
Nuclear Reactors Pose Problems 13
Pol Duwez
Marform Process 15
J. V. Bertrand
Stainless Steels Today 16
Francis B. Foley
Powder Metal Process 17
L. G. Klinker
Five Methods of Flaw Detection 18
Donald C. Erdman

DEPARTMENTS

Compliments ..... 11 Meeting Calendar 14
Employment 46

ASM REVIEW OF METAL LITERATURE

A — GENERAL METALLURGICAL 19
B — RAW MATERIALS AND ORE PREPARATION 20
C — NONFERROUS EXTRACTION AND REFINING 21
D — FERROUS REDUCTION AND REFINING 22
E — FOUNDRY 23
F — PRIMARY MECHANICAL WORKING 25
G — SECONDARY MECHANICAL WORKING 25
H — POWDER METALLURGY 27
J — HEAT TREATMENT 27
K — JOINING 28
L — CLEANING, COATING AND FINISHING 30
M — METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES 33
N — TRANSFORMATIONS AND RESULTING STRUCTURES 34
P — PHYSICAL PROPERTIES AND TEST METHODS 35
Q — MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION 37
R — CORROSION 39
S — INSPECTION AND CONTROL 42
T — APPLICATIONS OF METALS IN EQUIPMENT AND INDUSTRY 44
V — MATERIALS 45

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First World Metallurgical Congress to Be Held Next Fall Under Sponsorship of A.S.M.

Top-Ranking Scientists and Engineers of Free World Will Visit U. S. Plants, Attend Metal Congress and Show in Detroit, Present Scientific Papers and Discussions of World Resources

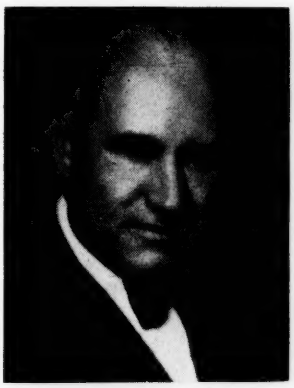
HUNDREDS of top-ranking metal scientists and engineers from the free countries of the world will assemble in the United States next fall for a first "World Metallurgical Congress". Sponsored solely by the American Society for Metals, the Congress will be held concurrently with the National Metal Congress and Exposition in Detroit, Oct. 15 through 19. The activities will also include a series of plant tours subdivided into various fields of interest, and occupying about a month's time prior to the Congress.

Zay Jeffries, retired vice-president of General Electric Co., world-renowned author and scientist, and dean of American metallurgists, has been appointed by the A.S.M. Board of Trustees as director-general of the World Metallurgical Congress. Dr. Jeffries recently returned from an extended trip through western Europe, where he visited numerous important cities conferring with government officials and leading representatives of the metallurgical industries. Dr. Jeffries reports a splendid and enthusiastic reception to the idea of the World Metallurgical Congress wherever he went.

Invitations have been issued to the Washington ambassadors of all the free countries concerned with metals, asking them to assist in the appointment of conferees. Assistance in this respect has also been tendered by American embassies abroad.

Proposals have been initiated through the Organization for European Economic Cooperation and the Economic Cooperation Administration to have funds allotted covering the expenses of conferees from Marshall Plan countries while they are in the United States. The O.E.E.C. in Paris and also E.C.A. officials in Washington are working closely with the A.S.M. and with the various governments to insure selection of only the highest caliber of technologists, scientists, production executives and sales engineers in the metal-producing and fabricating industries as official conferees. According to John W. Barnet of International Technical Services, Washington, D. C., who is serving as assistant to the director-general of the Congress, this promises to be the largest "technical assistance" project that has yet been undertaken here.

In addition to the Marshall Plan countries of Europe, delegations are expected from such important metallurgical centers as Australia, Japan, India, Spain, Mexico, and the South American countries.



ZAY JEFFRIES
Director-General
World Metallurgical Congress

Meanwhile, National Defense Mobilizer Charles E. Wilson has appointed W. H. Harrison, who is head of the Defense Production Administration, as government liaison man for the Congress. This action recognizes the importance of the event in national defense, since the prime purpose of the Congress will be to deal jointly with problems of conservation, utilization and substitution of strategic materials and to share scientific knowledge and technical and business know-how.

More than 150 of the leading metal producing and fabricating plants and research laboratories in this country will be visited in the preliminary inspection tours. Conferees will be divided into groups according to each person's predominating interest. Upon arrival in New York about Sept. 10, each of these groups will proceed on a guided tour.

Tentative plans are to have tours covering steelmaking and refining; nonferrous refining, rolling and fabminum and magnesium); ferrous fabrication (copper, brass, bronze, alurication (machining, forming, finishing); heat treatment; welding and joining; inspection and testing; and research laboratories, engineering societies and universities. During these travels the conferees will meet with resident engineers, technicians and executives in cooperation with A.S.M. chapters.

The tours will all converge in Detroit in time to participate in the National Metal Congress and Exposition. Here the conferees will be welcome to attend the regular technical sessions of the cooperating societies in the Metal Congress and to examine the products on display at the Exposition and discuss problems with the qualified engineers manning the various exhibits.

In addition, a complete World Metallurgical Congress program has been arranged, in which both American and foreign scientists and engineers will have an opportunity to exchange ideas and experiences.

All conferees have been invited to submit scientific papers which will be presented at special sessions throughout the week, and present indications are that a wealth of highly valuable information will be gleaned from this source. In addition to these special scientific sesions, there will be eight day-long sessions on industrial problems and general sessions on national and international aspects. These eight discussion meetings will correspond with the fields of interest covered by the various plant inspection tours.

Each of the foreign conferees will be invited to present a brief statement on some aspect of metallurgical practice in his plant or country which in his opinion is an important idea or operation worthy of attention in all countries and which will (*a*) enhance the ability of the free countries to produce more and better articles and implements of metal for the common good and safety, (*b*) better conserve and utilize the available resources in metals, metallurgical and fabrication plant and personnel, (*c*) suggest adequate substitutes in specific services for desirable metals and alloys which are in short supply. Each foreign conferee will have an American "opposite number", who will participate in the general discussion that follows. (These "opposite numbers" will be officially appointed by the Board of Trustees of the American Society for Metals. They will be men whose technical, scientific or business interests parallel as nearly as possible the technical, scientific or business interests of each foreign conferee.)

All of these special sessions of the World Metallurgical Congress will be open to the public. The official languages of the Congress will be English and French, although it is expected that all of the conferees will have a working knowledge of English.

"All our engineering executives attend the full week of the Metal Show"

The Chief Metallurgist for one of the largest automotive companies was speaking. "We hold meetings during the week to discuss what we've seen that's new at the Show. Besides being educational, the show enables us to talk with the producers of our materials and receive help on our problems—more important now than ever!"

Early demand for space at the Detroit Metal Show exceeds by far the reservations for any previous year. Interest in the technical program now being prepared is also unusually high.

For two years we have been organizing a World Metallurgical Congress, which will materialize in Detroit this fall. Leading metallurgists and industrialists in metal producing and metalworking plants in the Marshall Plan countries, as well as other friendly European nations and countries in South America and Central America, are being invited to attend and participate in the Detroit meeting. This activity has the approval and assistance of the Economic Cooperation Administration.

Sales and Advertising Managers say they plan to use this Show to help maintain good will during these days of increasing shortages. While a large proportion of the space has been assigned, good locations are still available in all halls.

If you want floor plans or further information, please write, wire or phone National Metal Exposition, 7301 Euclid Avenue, Cleveland 3, Ohio. Phone UTah 1-0200.

NATIONAL METAL EXPOSITION

Michigan State Fairgrounds

DETROIT, MICHIGAN

OCTOBER 15-19, 1951

W. H. EISENMAN, *Managing Director* • • **CHESTER L. WELLS,** *Assistant Director*

Jonassen Speaks on Welding Research at Sustaining Members' Night

Reported by Shadburn Marshall
Research Associate, U. S. Steel Co.

Sustaining Members' Night, an annual affair of importance for Pittsburgh Chapter A.S.M., was celebrated on the evening of Feb. 8. Representatives of the sustaining member companies were introduced by Chairman Wilder following dinner.

Feature of the evening was an address by Finn Jonassen, executive director of the newly formed Metallurgical Advisory Board of the National Research Council. Dr. Jonassen's talk was entitled "An Outline of Research Activities Related to Welding Structures". Leon Bibber, welding engineer, United States Steel Co., served as technical chairman.

A Portion of the Pittsburgh Chapter Audience at the February Meeting With Finn Jonassen, the Speaker, Answering a Question From the Floor

Dr. Jonassen outlined a research program initiated because of the structural failure of welded ships during the early phase of World War II and supported mainly by those agencies of the government concerned with the design and operation of ships. He pointed out, however, that findings from the fundamental aspects of this program can well be applied to all activities involving fabrication of steel by welding.

Studies of fractures in welded ships show them to be most commonly of the brittle type, propagated at very high velocities by elastic energy of the structure, and occurring at the lower operating temperatures and higher operating loads. In the few dozen cases where the steel was available for study, the fractures originated at stress raisers or notches occasioned by poor design and defective workmanship. Researches on large-scale hatch-corner specimens have demonstrated clearly how nominal load at failure and energy absorbed by a normally ductile steel are drastically decreased by faulty design incorporating stress raisers. It is the aim of the researches on materials to establish suitable specifications for all-welded ships, although at the present time riveted crack arrestors are used at strategic points.

Dr. Jonassen also pointed out that serious notches may at times result from tack welds or the welding of small clips to heavy sections long after a ship is in service. It is not, therefore, sufficient to attempt to insure the safety of welded structures by controlling design and workmanship. It is also important to select steels most capable of resisting the propagation of fracture at low operating temperatures when notches are inadvertently present. For this reason, many investigations are under way to study the factors that control brittle fracture.

One useful approach in these studies is the development of laboratory tests which may be correlated with large-scale tests and actual service failures. Such correlations are best when made at low temperatures and under such conditions that the absorbed energy level is low (in the order of 10 ft-lb. for the V-notch charpy test) and the rate of brittle crack propagation is high.

Many researches have explored the possible roles of fatigue and residual stresses in ship failures. At present it would appear that neither plays an important part. The conclusion with respect to residual stresses is subject to qualification, however, and recently a committee has been organized under the National Research Council to study this subject.

Toolsteel Developments and Machining Are Covered In Combination Meeting

Reported by Wm. J. Kennelly, Jr.
Latrobe Electric Steel Co.

The regular technical meeting of the New York Chapter A.S.M. on Feb. 5 was combined with the educational meeting of the month, resulting in an unusually large attendance. The technical talk on "New Developments in Metallurgy" was presented by Stewart G. Fletcher, chief metallurgist of Latrobe Electric Steel Co. The educational talk by M. Eugene Merchant, senior research physicist of the Cincinnati Milling Machine Co., covered "Machining".

After a brief description of the various grades of toolsteels now popular, Dr. Fletcher detailed some new developments in these materials. An outstanding development within recent years has been the addition of large amounts of vanadium to high speed and high-carbon high-chromium steels. With this addition, and a controlled increase in carbon, an extremely hard vanadium carbide is formed which will increase wear life by a factor of approximately 300% over similar steels without vanadium.

Dr. Fletcher pointed out that much is still to be desired in hot work steels used for extrusions. Development of the 12% Cr, 12% W type of precipitation hardening steel has increased the working range of hot work steels about 100 to 200° F.

The newest developments in the heat treatment of toolsteels have been in the broader applications of TTT-curves and the general acceptance of controlled-atmosphere furnaces and salt baths.

Much has been done in the perfection of mill procedures for the production and inspection of toolsteels. Segregation in high-alloy materials has been the cause of much distortion and cracking, but modern steels are now being produced free from this harmful carbide segregation.

Introduction of the ultrasonic method of inspection has provided a rapid and simple mill method affecting internal defects and rejecting defective parts. The old and laborious process of cutting disks and hot acid etching often failed to reveal such flaws.

Dr. Merchant presented an interesting talk, supported by slides, on the mechanism of chip formation in machining. He used as an example the machining of the 16-25-6 alloy and developed the economic selection of speeds and feeds on this material. The effect of various lubricants in machining was also discussed.

DON'T MISS—
World Metallurgical Congress
National Metal Congress
National Metal Exposition
Detroit—Oct. 15 to 19, 1951

Economies in Steelmaking Discussed

Harry McQuaid (Second From Left) Told St. Louis Members How Modern Developments Effect Economies in Steelmaking. In the photograph are also H. A. Ball of Western Brass Co.; Mr. McQuaid; Verne Pulsifer, vice-chairman of the chapter; L. W. Morrell of Revere Brass and Copper Co.; and Martin E. Huether, chapter secretary-treasurer

Reported by G. A. Fisher, Jr.
International Nickel Co., Inc.

Harry W. McQuaid, consultant, added significance to the "25-Year Member Night" of the St. Louis Chapter by reviewing briefly the history and progress of steelmaking. He also gave an up-to-the-minute talk on "New Economies in Steelmaking and Processing".

The economics of steel production is vitally affected by the location of the plant and its juxtaposition with raw material sources and consumer outlets, Mr. McQuaid pointed out. He reviewed the past and present procedures for the production of steel by the reduction of carbon in the bessemer, openhearth and electric furnace, and illustrated some of the economies made possible by faster melting and changes in processing in the electric furnace.

Deoxidation by silicon at a low temperature affects not only the economics involved but also the properties of the steel produced, he said.

The possibilities of reduction of iron oxide in the blast furnace with hydrogen or other reducing gas rather than coke were mentioned.

Mr. McQuaid pointed out the beneficial effects of continuous casting of steel forms which more nearly approach the final desired form. Slabs can be continuously cast to a maximum thickness of 4 in. and successfully rolled into finished plate or strip.

Mr. McQuaid discussed the need for development in processing. In some of the large steel producing plants integration is so complete that the relative final profit rates are low. Equipment is not retired in a short enough period to change processing in line with developments, and these plants have been slow to accept new processing methods because of their high investments in present equipment and their desire to use such equipment for the maximum length of time.

It is most economical to select a steel which will be just good enough for the final job; it should be neither better than necessary nor not quite good enough. The speaker pointed out the desirability of keeping the stresses in a quenched and tempered piece of steel in the right direction, and also discussed the effect of quenching rate upon the final properties of steels.

Akron Breaks Own Record With Educational Course On Welding Metallurgy

Akron Chapter's recently completed educational course on "Welding Metallurgy", with a registration of 511, again broke all records and far exceeded expectations of the Educational Committee and the chapter officials.

The course consisted of six weekly 1½-hr. lectures, followed by a panel discussion on the seventh and final night. Registration fee was $2, which covered only the cost of the text, namely, "Welding Metallurgy" by O'Henry and Claussen, as revised by Linnert.

The lectures were given basically from an engineering point of view, since a large portion of the group consisted of mechanical engineers, draftsmen and shop personnel. Additional welding data of particular interest to the Akron group, such as welding of light metals, cast iron and copper alloys, were supplied by the instructors. Based on the comments from the class, all three instructors — C. R. Augden, J. T. O'Connor, and N. C. Jessen—appear to have succeeded in getting the rather complex problems of welding metallurgy across in a simple and basic manner without becoming involved in too much detail, likely to be rejected by a group of nonmetallurgists.

All lectures were given at Akron University, which has cooperated splendidly with the chapter in these educational programs. Because of the unexpectedly large registration, it was necessary to split the class into two groups, the first and most popular meeting at 6:30 and the second at 8:15. The instructors consented graciously to this extra burden.

Attendance averaged about 300 per lecture, which was considered gratifying in view of the condition of Akron streets during the ice and snow season. At the last meeting, more than 99% of those present voted for a similar course next year, and were asked to suggest subjects.

The Educational Committee consisted of N. C. Jessen, chairman, T. W. Sproull, G. D. Ries, John Cox, and Blair Armstrong, all of Babcock & Wilcox Co.

"Metallurgy of Grinding" Traces Wheel Evolution

Reported by W. B. Moore
Technical Service Engineer
Reynolds Metals Co.

The "Metallurgy of Grinding" was elucidated for the Louisville Chapter A.S.M. on Feb. 6 by H. S. Brink, president of Industrial Abrasives, Inc., and of the Industrial Plastics Co. Mr. Brink is widely known in metallurgical circles, having been chief industrial engineer for Carnegie-Illinois Steel Corp. at Gary, and for Ampco Metals, Inc., in Milwaukee.

Mr. Brink introduced his paper with a history of grinding, centering around the evolution of new and better grinding wheels from sandstone to emery, silicon carbide and diamond-impregnation. He then showed an excellent movie on certain phases of surface grinding.

The speaker then discoursed on the grinding of various types of rolls, pointing out the advantages of grinding over turning. The methods of grinding rolls, as well as the reasons for these methods, were outlined in detail.

At the conclusion of his talk Mr. Brink presented some slides illustrating the general principles of spark testing.

The coffee talk was presented by William Slider, pastor of the Epworth Methodist Church in Louisville. His theme was the error in a too-specialized life, with stories and amusing incidents as illustrations.

Course in Electron Microscopy

A summer laboratory course in "Techniques and Applications of the Electron Microscope" will again be given by the laboratory of electron microscopy in the department of engineering physics of Cornell University.

The classes will meet from July 9 to 21. The course is designed for research workers, institutional and industrial, who have recently entered the field of electron microscopy or are planning to undertake research problems in this field. Further inquiries should be addressed to Prof. Benjamin M. Siegel, department of engineering physics, Rockefeller Hall, Cornell University, Ithaca, N. Y.

Mauthe to Receive McFarland Award

Penn State Chapter A.S.M. has announced the selection of J. Lester Mauthe as the 1951 recipient of the David Ford McFarland Award for Achievement in Metallurgy.

J. L. Mauthe

Mr. Mauthe, president of the Youngstown Sheet and Tube Co., will receive the award at a dinner meeting on May 4, at State College, Pa. After the dinner Mr. Mauthe will speak on "Economics and Engineering for Production of Modern Steels".

The award was established in 1949 as an annual recognition to a metallurgy alumnus of the Pennsylvania State College for attainment of eminence in the metallurgical profession.

Mr. Mauthe received his B.S. in metallurgy at Penn State in 1913. He joined the National Tube Co. at McKeesport and became assistant superintendent of blast furnaces in 1915. He subsequently held similar capacities with the Midvale Steel Co. of Coatesville, Pa., and Illinois Steel Co. at Gary, Ind. In 1920 he was appointed superintendent of blast furnaces at National Tube Co., Lorain, Ohio, and assistant superintendent in 1930.

In 1935 Mr. Mauthe joined Youngstown Sheet and Tube Co. as assistant superintendent of the Campbell Plant, and was elevated to general superintendent of the Youngstown district in 1937. He was made vice-president of operations in 1943, elected a company director in 1946, and president in 1950.

Among his published works, Mr. Mauthe is co-author of "Mineralogy of Basic Openhearth Slags", which received the American Iron and Steel Institute Medal in 1947.

Friends of the chapter and of Mr. Mauthe who can attend the May meeting are invited to make banquet reservations with William Schuld, Sigma Phi Sigma, State College, Pa.

Milne Opens New Warehouse

A. Milne & Co., tool and specialty steel distributors, New York City, announce the opening of a new tool-steel warehouse at 20 South Charter St., Dayton, Ohio, under the direction of John I. Kitts.

The steels available from Milne at Dayton will include hollow and solid toolsteels, in standard oil hardening, air hardening and water hardening grades; also hot work and shock-resisting toolsteels. The Dayton Warehouse is the ninth distribution point for Milne stocks throughout the U.S.

Panel Discussions Cover Heat Treatment

Panel on Heat Treatment of Ferrous Metals at One of Two Meetings Constituting Puget Sound's Educational Program. C. Y. Youlten covered case hardening; Jack Finley (standing), toolsteels; Harry Evans, moderator; Jim Gow, stainless steels; and Dick Hargus, structural steels

Reported by E. J. Turner
Boeing Airplane Co.

The annual educational lecture series of the Puget Sound Chapter A.S.M. was presented in the form of two panel discussions on heat treatment of ferrous and nonferrous alloys on Feb. 19 and 26. A panel consisted of four speakers and a moderator, with each speaker allotted 15 min. for a general discussion on his assigned subject. These talks were followed by an hour of questions from the audience.

The first meeting covered the heat treatment of ferrous metals with H. P. Evans of Boeing Airplane Co., as moderator. J. A. Finley, University of Washington, opened the program with a discussion of heat treatment of toolsteels. He stressed the need for homogenizing toolsteel with adequate preheat followed by closely controlled soaking at the required temperature.

R. W. Hargis, Isaacson Iron Works, covered the subject of structural steels with respect to the main functions of thermal treatment in structural steels and stress-relief of welded assemblies. James Gow, Electric Steel Foundry Co., covered stainless steels. Stress-relief of austenitic steels, hardening of martensitic steels, and annealing of the ferritic types were considered. J. C. Youlton, Commercial Steel Treaters, Inc., took up case hardening, particularly with respect to the economics of carburizing, nitriding and carbonitriding.

The second meeting on nonferrous metals was conducted by M. E. Parker, Edison Technical School, as moderator. First, the heat treatment of aluminum alloys was discussed by J. W. Sweet, Boeing Airplane Co. Mr. Sweet presented the theory of precipitation hardening as well as the various thermal treatments used in hardening and annealing aluminum and its alloys.

J. F. Baisch, Jr., Boeing Airplane Co., then spoke on magnesium alloys, stressing the precautions necessary to prevent voids, burning, and other hazards encountered in the heat treatment of magnesium and its alloys. L. T. Holt, consulting metallurgist, reviewed the heat treatment of copper-base alloys. Most of Mr. Holt's talk was concerned with beryllium copper, its properties and heat treatment. Finally, W. L. Slosson, Boeing Airplane Co., covered the heat treatment of titanium, Inconel X, and the Haynes Stellite cobalt-base high-temperature alloys. Because of the increasing interest in titanium, Mr. Slosson devoted most of his discussion to this metal.

DON'T MISS—
World Metallurgical Congress
National Metal Congress
National Metal Exposition
Detroit—Oct. 15 to 19, 1951

Answers 150 Questions On Recent Advances

Reported by Arthur C. Willis
Instructor,
Southern Methodist University

A talk on "Recent Advances in Metallurgy" before the North Texas Chapter A.S.M. in January, was purposely kept brief and general by the speaker, Vincent T. Malcolm, director of research and development for the Chapman Valve Mfg. Co. Most of the evening was therefore open for the question-and-answer period, which lasted more than an hour; it is estimated that 150 questions were put to the speaker during the evening.

Mr. Malcolm illustrated many of his points by reference to a film on valve manufacture. In the course of the discussion, it was brought out that virtually every steel can be welded, given the proper technique. Also mentioned were the various methods of surface hardening, including Chapmanizing and nitriding.

Metallurgical Advisory Board Starts Work on Three Urgent Problems

Work is already under way by the newly organized Metallurgical Advisory Board on three of the most urgent problems in the field of metals. The board was organized by the National Academy of Sciences, National Research Council, to advise the Research and Development Board, Department of Defense, on research matters.

The three problems currently under study have to do with critical and strategic metals and their substitutes, the application of metals at high temperatures, and the development of the titanium industry.

Robert F. Mehl, head of the department of metallurgy, Carnegie Institute of Technology, is chairman of the Metallurgical Advisory Board. Members are:

E. C. Bain, assistant vice-president, United States Steel Corp. (A.S.M. past president).

John Chipman, head of the department of metallurgy, Massachusetts Institute of Technology (currently A.S.M. vice-president).

Charles H. Herty, Jr., assistant to the vice-president, Bethlehem Steel Co. (A.S.M. past president)

Zay Jeffries, retired vice-president of General Electric Co. (A.S.M. past president).

Walter E. Jominy, staff engineer, Chrysler Corp. (currently A.S.M. president).

A. B. Kinzel, president, Union Carbide & Carbon Research Laboratories, Inc.

Paul D. Merica, executive vice-president, International Nickel Co. of Canada, Ltd.

Albert J. Phillips, director of research, American Smelting and Refining Co.

Leo F. Reinartz, assistant vice-president and manager, Armco Steel Corp.

Cyril S. Smith, director, Institute for the Study of Metals, University of Chicago.

Earle C. Smith, chief metallurgist, Republic Steel Corp.

Kent R. Van Horn, associate director of research, Aluminum Co. of America (A.S.M. past president).

Clyde Williams, director, Battelle Memorial Institute.

Ex-Officio members of the board are C. Richard Soderberg, chairman, division of engineering and industrial research, National Research Council; Oliver C. Ralston, chief metallurgist, U. S. Bureau of Mines; and John G. Thompson, chief, metallurgy division, National Bureau of Standards.

Finn Jonassen of the National Research Council is executive secretary, and V. H. Schnee, vice-president, University of Oklahoma, is executive director of the Metallurgical Advisory Board. William E. Mahin, director of research, Armour Research Foundation (currently chairman of the Chicago Chapter A.S.M.), has been named director of the metallurgical projects division, in which capacity he will spend three days of each week in Washington.

Modern Theory of Elasticity Explained

J. A. Sauer (Extreme Left) Explained the Finite-Strain Theory of Elasticity at Penn State in February. Next to him are J. H. Wernick, technical chairman; T. A. Prater, chapter treasurer; and D. F. McFarland, retired professor of metallurgy at Penn State College

Reported by William W. Wentz
Pennsylvania State College

"Modern Aspects of the Theory of Elasticity" were explained at the February meeting of the Penn State Chapter A.S.M. by J. A. Sauer, head of the engineering mechanics department at Pennsylvania State College.

Dr. Sauer began his talk with a brief history of the formulation and subsequent growth of the classical theory of elasticity. He then showed that the commonly known theory, though very useful in ordinary construction work, is not applicable to highly elastic bodies. The modern finite-strain theory has been applied to highly elastic materials in laboratory experiments and has proven to be quite satisfactory.

Some of the outstanding features of the finite-strain theory are: (*a*) It predicts qualitatively a yield point for highly elastic bodies; (*b*) it proves the existence of different yield stress values for tension and compression; (*c*) it indicates a nonlinear stress-strain relationship in highly elastic bodies; and (*d*) it predicts a volume change under shear stress alone. The theory has great possibilities but is still very definitely in the development stage, the speaker pointed out.

Fatigue Strength May Be Misleading as Design Criterion, Horger Warns

Reported by H. E. Boyer
Chief Metallurgist, American Bosch Corp.

A store of data on the "Relationship of Metallurgy and Design," illustrated by slides of the speaker's studies, was presented by Oscar J. Horger before the Springfield Chapter A.S.M. at the February meeting.

Dr. Horger, who is chief engineer of the railway division, Timken Roller Bearing Co., said that engineers can be grossly misled by placing too much confidence in fatigue strength of materials determined from standard test bars by conventional laboratory methods. Fatigue values obtained by this method are often reduced to 20 or 25% of the calculated value in actual service.

Such drastic discrepancies in fatigue resistance are the result of both metallurgical and design factors. Surface decarburization on unmachined parts is one of the common offending metallurgical factors. Poor geometry or shape as represented by tool marks and lack of radii is a common mechanical offender.

Fatigue tests should be made on actual members, and Mr. Horger showed pictures of such installations in use at the Timken laboratories. Stress analysis studies will help in the selection of materials and design for highly stressed members.

Shot peening and rolling can be used to increase fatigue resistance, particularly where high stress concentrations are present. It is often advantageous to use shallow hardening rather than deep hardening steels, since "shell hardening" provides a more favorable residual stress system.

Likewise, drastic quenching from the tempering temperature improves fatigue resistance by providing a beneficial residual stress. In this method no structural change is produced and ductility values are not sacrificed as they are when parts are quenched from above the critical temperature and tempered at a low temperature to obtain the desired residual stress.

Lecture Series Meets Needs of Shopmen and Industrialists in Spokane

Reported by Clayton O. Matthews
Kaiser Aluminum & Chemical Corp.

The success of the project was certain when the turnout for the first class zoomed to 114 persons. That was the experience in Spokane when a series of nine lectures entitled "Practical Metallurgy" was introduced in February, sponsored jointly by the Inland Empire Chapter A.S.M. and the Washington State College Spokane Center. The course met the present needs among industrialists and employees in this region for a better understanding of metals and their changes during production.

Among persons attending were supervisors, chemists, shop foremen, inspectors, laboratory technicians, welders, foundrymen, and production workers. Several companies sent employees as a part of their training program. The lecturers, all A.S.M. members from the staffs of Washington State College, Gonzaga University, and Kaiser Aluminum and Chemical Corp., were selected for the subjects in which they were particularly experienced.

The course was introduced with lectures explaining the principles behind the changes in metal properties and the effect on the internal structure. Servet A. Duran, associate professor of metallurgy, and Curtis L. Graverson, research metallurgist, Washington State College, lectured on metal states, properties, and alloys. D. W. Smith, chief metallurgist, and Maurice C. Fetzer, physical metallurgy head, both of Kaiser Research Division, discussed mechanical deformation, age hardening, and ferrous heat treatment.

The concluding lectures described production and fabrication methods and material testing. Mr. Graverson described foundry methods and problems in this group. Wilbur J. Lawler, production metallurgist, Max E. Tatman, welding research head, and E. W. Everhart, corrosion research head, all of Kaiser Aluminum, talked on metal forming, fusion joining, finishing, and corrosion. John Matthews, instructor, and Dean James G. McGivern, School of Engineering, Gonzaga University, lectured on machining and testing of materials.

The smooth functioning of the class was due to the efforts of Professor Duran, who was designated educational coordinator for the course. Walter Flatow, Educational Committee chairman for the chapter, did the promotional work and called on all industrial plants in the region. Through the combined efforts of these committeemen, chapter officers, and the cooperation of the members, the Inland Empire Chapter was successful in passing on more metallurgical know-how to the people of Spokane, and plans are under way for additional courses to be offered this enthusiastic group of metalworkers.

Direct Course on Practical Metallurgy

After Discussing Plans for the Inland Empire Chapter Metallurgy Course, Dana W. Smith, Kaiser Aluminum Research Division, Shows an Aluminum Test Sheet to Clayton O. Matthews, Chapter Chairman, and Walter Flatow, Educational Committee Head. Inset is Prof. S. A. Duran of State College of Washington, who was educational coordinator for the course

Metallurgical Uses of Electron Methods Shown

Reported by J. W. Poynter
Metallurgist
Wright Patterson Air Force Base

The principles of electron microscopy and electron diffraction both have applications in metallurgical studies, R. D. Heidenreich of the Bell Telephone Laboratories explained in a talk at the February meeting of the Dayton Chapter A.S.M. He indicated the type of information that can be obtained from each of these methods.

Comparing the electron microscope with optical microscopy, Dr. Heidenreich pointed out that electrons have a wave length on the order of 0.05 Å, while the wave length of light is several thousand Ångstrom units. Because of this far greater resolution, any surface films or impurities on the surface of the specimen may lead to erroneous conclusions.

After explaining how replicas are prepared, the speaker described the application of these methods to several metallurgical problems. Pearlite in steels gives a clear-cut diffraction pattern characteristic of iron carbide, but this pattern is not given by bainite or martensite. In the nonferrous field, electron micrographs will show why the addition of 0.01% silver to lead gives much better properties.

Compliments

To the AKRON CHAPTER A.S.M. on their use of radio news broadcasting services for announcing chapter meetings. Akron officials believe this is possibly the first A.S.M. chapter to use radio facilities in this way.

♦ ♦ ♦

To ATLANTIC STEEL CO. and its president, ROBERT S. LYNCH (past chairman, Georgia Chapter A.S.M.), on the company's production records and expansion program, described in a feature article in the business section of the *Atlanta Journal-Atlanta Constitution.*

♦ ♦ ♦

To BRUCE W. GONSER on his appointment as an assistant director of Battelle Memorial Institute. The new post was created as a result of science and industry's current interest in the technology of the less common metals, a field in which Dr. Gonser has specialized at Battelle since 1934.

♦ ♦ ♦

To H. H. UHLIG, head of the corrosion laboratory, Massachusetts Institute of Technology, on his selection to receive the 1951 Willis Rodney Whitney Award of the National Association of Corrosion Engineers, for contributions to the science of corrosion. Also to KIRK H. LOGAN, research engineer of the Cast Iron Pipe Research Association, on his selection to receive the Frank Newman Speller Award for contributions to corrosion engineering.

Analyzes Iron Ore Potentialities of South America

Reported by James H. Brown
Ritter Co., Inc.

"The Saga of South American Iron Ore", as presented by John V. Beall, editor of *Mining Engineering* and eastern secretary of the Mining Branch of the A.I.M.E., constituted an interesting analysis of the ore potentialities of South America as they are known today. Mr. Beall addressed the Feb. 5th meeting of the Rochester Chapter A.S.M., held jointly with the Superintendents and Production Managers Group of the Industrial Management Council of Rochester.

The three major potential ore suppliers in South America are Chile, Brazil and Venezuela. At present, the United States imports some 2½ million tons of ore from Chile each year, and Mr. Beall does not expect much change to come in this figure in the next few years.

Brazil, on the other hand, has vast slightly developed ore supplies of good grade. Exploitation of these deposits is hindered to some extent by the limited carrying capacity of the railroad lines from the interior of the country. Furthermore, foreign capital is not encouraged by the relatively unstable political setup and by the shaky land tenure which goes along with such a situation. Mr. Beall also pointed out that Brazilian law requires that 51% of an enterprise be Brazilian owned. In spite of this, however, we are receiving ore from Brazil in ever-increasing quantities.

As to the question of local exploitation of iron ore deposits for local consumption, Mr. Beall believes that the average South American living standard is too low to support a steel industry of any size.

The last country mentioned, Venezuela, has long been a fertile field for foreign capital. For many years before the importation of iron ore became economically profitable in this country, the existence of large ore deposits in Venezuela has been known. At present, some of these deposits are being worked by the Bethlehem Steel Co., and the exportation of ore to the United States by that company has just started. It was in Venezuela that the spectacular discovery of the Cerro Bolivar deposit was made in 1947 by the United States Steel Co. From this mountain of almost pure iron ore the United States should be receiving large imports in approximately three years.

Mr. Beall's lecture was well illustrated with slides showing production figures, maps, and striking views of the Cerro Bolivar discovery.

Foundry Industry Enjoying Renaissance

At Philadelphia Chapter's Past Chairmen's Night: Claire C. Balke, Chairman of the Program Committee; Joseph Gray Jackson, Chapter Chairman; H. F. Taylor, Speaker; and Clyde B. Jenni, Technical Chairman

Reported by George L. Schiel
Chief Metallurgist, Metlab Co.

A renaissance in the foundry industry is currently occurring according to Howard F. Taylor, associate professor of mechanical metallurgy at Massachusetts Institute of Technology. With the advent of better quality and improved design and application, castings are now beginning to occupy their rightful position. Professor Taylor addressed the January meeting of the Philadelphia Chapter A.S.M. on the occasion of Past Chairmen's Night.

Castings are a sound engineering material when properly applied and designed in the blueprint stage, the speaker explained. In designing a product, consideration must be given to castings, forgings, weldments, and powder metal compacts as representing complementary rather than competitive methods of fabrication. In the past the successful use of castings has suffered from improper application, poor quality, poor design and lack of favorable publicity.

Mechanization of foundries has reduced costs and brought castings into a more competitive position, Professor Taylor stated. New developments such as cast armor, shell molding, ductile iron and semi-precision castings are opening up new fields of use. New research is being undertaken to help solve some of the ever-present foundry problems such as shrinkage, tears, dishing and pinholes.

At the close of the lecture Clyde B. Jenni of General Steel Casting Co. led the discussion as technical chairman of the meeting.

Earlier in the evening past chairmen were honored with the presentation of certificates of appreciation. Fourteen 25-year certificates were also awarded to members.

Employes of the Midvale Co. entertained at dinner with a musical program.

Airplane Wheels & Brakes Absorb Tremendous Loads

Reported by James L. Foster
Metallurgist, Wheel & Brake Div. Goodyear Aircraft Corp.

Akron Chapter was treated to a novel subject and a fine talk by a past chapter chairman at the February meeting. A. C. Gunsaulus, manager of the development department, Wheel & Brake Division, Goodyear Aicraft Corp., presented the highlights of the development of wheels and brakes for aircraft since the turn of the century.

Describing the design of equipment for modern high-speed aircraft, he listed performance requirements that pointed up the tremendous loads the wheel must withstand and the high energies the brake must absorb.

Materials for aircraft wheels and disk-type brakes were described, together with the laboratory testing procedures and equipment necessary to determine the worth of a design. Application of stress analysis has made an important contribution to weight reduction, and Mr. Gunsaulus stated that engineers are constantly in quest of better wheel and brake designs and materials.

Numerous slides were interspersed throughout the talk to illustrate the progress thus far attained.

Coffee speaker was Harold P. Brown of the B. F. Goodrich Research Center. His subject, "Cancer and Environment Research," stressed the potential hazards in chemical industries.

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Nuclear Reactors Pose Two Problems For Metallurgists

Reported by Rebecca H. Smith
Northrop Aircraft, Inc.

The new problems which peacetime use of atomic energy will bring to the metallurgist were discussed by Pol Duwez of California Institute of Technology at the Jan. 25th meeting of the Los Angeles Chapter A.S.M. Dr. Duwez, in addition to being associate professor of mechanical engineering at Caltech and head of the materials division at the Jet Propulsion Laboratory, is a member of the Scientific Advisory Board to the Commanding General of the United States Air Force.

An atomic reactor can be used as a power plant for commercial applications just like any other heat source, except that fluid circulating in an atomic reactor becomes slightly radioactive, the speaker said. It might be advisable to use a heat exchanger to catch any dangerous fission products and allow the second fluid to run the engine, he suggested.

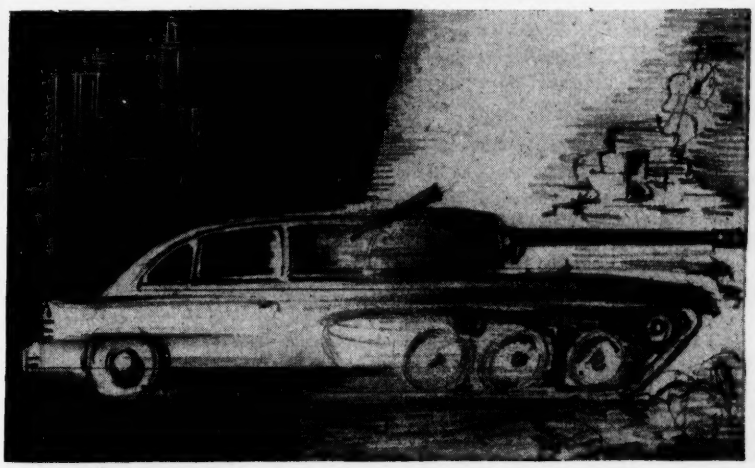
The development of proper materials for such atomic power plants requires a good understanding between physicists and metallurgists, Dr. Duwez told the group. As a start in this direction, he gave a clear explanation of the basic nuclear physics involved, then described the components of an atomic pile.

The "fuel" is a fissionable atom such as U^{235}, which, when bombarded with neutrons, splits into fission products and more neutrons. The latter are moving too fast to bombard other U^{235} atoms and thus establish the desired chain reaction, so their speed is reduced by allowing them to collide with atoms of light mass. Carbon is frequently used for the "moderator"—as this material which slows down the neutrons is called. To prevent neutrons from escaping from the atomic pile, the fuel and moderator are surrounded by some such metal as tantalum or stainless steel, which is termed the "reflector".

Dr. Duwez said there are two types of problems now confronting metallurgists in connection with nuclear reactors. First, the nuclear properties of the materials used in atomic piles must be studied; and second (since the high radiation level in an atomic pile will influence the structure of all materials exposed to it) the nuclear resistance, or stability toward radiation, must be determined. Much progress is being made, the speaker remarked, but there are still such questions as corrosion, protection of uranium, and stopping fission products to be solved.

Radiation, Dr. Duwez stated, consists of three groups: the gamma and beta rays, which can be disregarded as far as any permanent effect on metals is concerned; the fission products, which are highly radioactive and have high energy, but fortunately possess only low velocity and thus are not too important; and the neutrons, which have both high energy and high velocity. If a neutron is captured by an atom, a radioactive isotope is formed. These isotopes are being used to explore such fields as the mobility of atoms, segregation, and self-diffusion. Dr. Duwez classed radioactive isotopes as the gift of atomic energy to metallurgists, since they can be used for research which could not be accomplished in any other way.

However, if a neutron is not captured, it collides with an atom and creates damage by disturbance. Work on the effect of radiation on pure aluminum, as reported in the December 1950 issue of *Metal Progress*, indicates that this damage by disturbance hardens metal in a manner similar to cold work. Dr. Duwez raised the question whether radiation might not soften an age hardened material like beryllium copper. This is only one of the many questions which metallurgists will want to answer in the future.



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CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	May 9			Dinner Dance
Baltimore	May 8	Engineers Club	W. E. Jominy	National Officers Night
Boston	May 11	Shelton Hotel	H. A. Winne	The Future of Atomic Energy, (N.E. Regional Meeting)
British Columbia	May 10	B. C. E. Social Club		Annual Meeting
Buffalo	May 3	Troop I Post		Annual Meeting
Calumet	May 8	Phil Smidts, Hammond, Ind.	L. H. Nelson	Quality Control
Canton-Massillon	April 9	Mergus Restaurant	Leo P. Tarasov	Metallurgical Problems in Grinding
Chicago	May 14	Furniture Club	Wm. J. Harris Jr.	Low Alloy Steels
Cincinnati	May 11	Terrace Park Country Club		Election Outing
Cleveland	May 7	Tudor Arms Hotel	Zay Jeffries	Zay Jeffries Night
Columbus	May 2	Broad St. Church of Christ	G. A. Roberts	New Developments in Tool and Die Steels
Dayton	May 9	Engineers Club	R. M. Lloyd	Iron Ore Resources (Annual meeting)
Detroit	May 14	Rackham Bldg.	Howard J. Stagg	Some Aspects of Toolsteel
Eastern N. Y.	Apr. 10	Circle Inn	C. D. Moriarty	Nondestructive Testing in Manufacture of Turbines
Fort Wayne	May			Social Meeting
Hartford	May 8	The Hedges	G. R. Gohn	Fatigue (Past Chairmen's Night)
Kansas City	May 23			Annual Banquet
Los Alamos	May 18	Los Alamos High School	A. O. Schmidt	Theory and Practice in Metal Cutting
Los Angeles	May 24	Rodger Young Audit.	O. Hammer	Metallurgical Problems in the Manufacture of Oil Tools
Louisville	May 1	Kapfhammer's Party Home		Social Meeting
Mahoning Valley	May 8	National Malleable & Steel Castings Co.		Plant Visitation Night
Montreal	May 7			Annual Meeting; Ladies' Night; Past Chairmen's Night
Muncie	May 8	Delaware Hotel		Ladies' Night
New Haven	May 17	Actors Colony Inn, Derby	Charles T. Evans, Jr.	Recent Developments in High-Temperature Metallurgy
New Jersey	May 21	Essex House, Newark	Col. B. S. Mesick	John F. Wyzalek Memorial Award Night
New York	May 14	2 Park Ave	A. M. Setapen	Brazing
North Texas	May 16	Dallas	A. O. Schmidt	Theory & Practice in Metal Cutting
North West	May 17	Covered Wagon	J. O. Almen	Fatigue and Impact of Steel
Northern Ontario	May 16	Windsor Hotel, Sault Ste. Marie		Annual Meeting
Northwestern Pa.	May 17	Erie, Pa.	Mrs. Julia Kiene	Ladies' Night
Notre Dame	May 9	Engineering Bldg., Univ. of Notre Dame	Bernard R. Queneau	Temper Brittleness
Ontario	May 4	Royal York Hotel, Toronto	Bruce Chalmers	Metal Crystals
Ottawa Valley	May 9	Rideau Room, Murphy-Gambles	J. U. MacEwan	Smelting of Lead
Penn State	May 4	Nittany Lion Inn	J. L. Mauthe	Economics & Engineering for Production of Modern Steels
Peoria	May 14	Morton Civic Bldg.	Harry B. Osborn, Jr. Milton Garvin	Induction Versus Flame Hardening
Philadelphia	May 10	Engineers Club	R. F. Mehl	Transformations in Steel
Pittsburgh	May 9	Roosevelt Hotel	J. B. Austin	Application of Physical Chemistry in the Metals Industry
Puget Sound	May			Ladies' Night
Purdue	May 15			Annual Meeting
Rhode Island	May 10		Walter E. Jominy	Reducing Wear by Proper Metallurgy
Rochester	May 14	Elks Club		Annual Meeting and Election of Officers
Rockford	May 23	Faust Hotel		
Rocky Mountain	May	Colo. Springs		Joint Meeting with Pueblo Group
Rome	May 7	Elks Club	F. E. Johnson	Color Photography in Industry
Saginaw Valley	May 15	Fischer Hotel, Frankenmuth		Ladies' Night
Southern Tier	May 15	Iron Kettle Inn	Panel	Ductile Cast Iron
St. Louis	May 18	Forest Park Hotel	Michael Field	Principles and Practice of Metal Machining
Springfield	May 21	Hotel Sheraton	Howard S. Avery	Abrasion and Wear in Tools and Machines
Terre Haute	May 7	Indiana State Teachers' College Student Union		Deep Drawing and Stamping
Texas	May 1	Ben Milam Hotel, Houston	H. Maurice Banta	Metallurgical Problems Encountered in the Drilling of Deep Oil Wells

Toledo	**May 17**	Maumee River Yacht Club		Old Timers Night; Home Talent Night
Tri-City	**May 1**	Rock Island Arsenal Cafeteria	**W. H. Splinter**	Trouble Shooting in the Machine Shop
Tulsa	**May 14**		**A. O. Schmidt**	Carbide Machining
Utah	**May 26**	Big Cottonwood Canyon		Visit to Eimco Plant & Spring Party
Warren	**May 10**	Mullins Mfg. Co.		Plant Visitation
Washington	**May 7**		**W. E. Jominy**	National Officer's Night
West Michigan	**May 21**	Morton House, Grand Rapids	**W. G. Nelson**	Industrial Rubber
York	**May 9**		**W. E. Jominy**	

IMPORTANT MEETINGS FOR MAY

May 4 — American Association of Spectrographers. Symposium on Uses of Spectroscopy in the Steel Industry, Society of Western Engineers Bldg., Chicago. (Ralph H. Steinberg, Symposium Committee, American Association of Spectrographers, 9531 Avalon Ave., Chicago 28.)

May 6-9—Copper & Brass Research Association. Annual Meeting, The Homestead, Hot Springs, Va. (T. E. Veltfort, Manager, C.B.R.A., 420 Lexington Ave., New York 17.)

May 11—Cleveland Section, American Welding Society. 12th Annual Welding Conference, Hotel Allerton, Cleveland. (Symposium Committee, A.W.S., Hotel Allerton, Cleveland.)

May 11—Engineering Institute of Canada. Annual Meeting, Mount Royal Hotel, Montreal. (L. Austin Wright, General Secretary, E.I.C., 2050 Mansfield St., Montreal 2, Canada.)

May 13-16—American Institute of Chemical Engineers. Regional Meeting, Hotel Muehlebach, Kansas City, Mo. (S. L. Tyler, Executive Secretary, A.I.Ch.E., 120 East 41st St., New York 17.)

May 14-16—Industrial Furnace Manufacturers Association. Annual Meeting, The Homestead, Hot Springs, Va. (S. N. Clarkson, Executive Vice-President, I.F.M.A., 420 Lexington Ave., New York 17.)

May 16-18—Society of Experimental Stress Analysis. Spring Meeting, National Bureau of Standards, and Wardman Park Hotel, Washington, D.C. (Dr. Edward Wenk, Jr., c/o David Taylor Model Basin, Washington 7, D.C.)

May 17-18—Lead Industries Association. Annual Meeting, Biltmore Hotel, New York. (Robert L. Ziegfeld, Secretary, L.I.A., 420 Lexington Ave., New York 17.)

May 21-23—International Acetylene Association. Annual Convention, Windsor Hotel, Montreal. (H. F. Reinhard, Secretary, I.A.A., 30 East 42nd St., New York 17.)

May 21-22—American Zinc Institute. Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest V. Gent, Secretary, A.Z.I., 60 East 42nd St., New York 17.)

May 23-24—American Iron & Steel Institute. General Meeting, Waldorf-Astoria Hotel, New York. (George S. Rose, Secretary, A.I.S.I., 350 Fifth Ave., New York 1.)

May 23-24—American Society for Quality Control. Fifth National Convention, Public Auditorium, Cleveland. (Simon Collier, Secretary, A.S.Q.C., 22 East 40th St., New York 16.)

May 30-June 2—Metal Treating Institute. Spring Meeting, Hotel Colorado, Glenwood Springs, Colo. (C. E. Herington, Executive Secretary, M.T.I., 271 North Ave., New Rochelle, N. Y.)

President Has Dual Speaking Role

National Officers' Night of Lehigh Valley Chapter Attracted 125 Members on Feb. 9 to Hear Walter E. Jominy (Right) in the Dual Role of Coffee Speaker and Technical Speaker. At left is B. F. Shepherd, A.S.M. past president and technical chairman of the meeting, and center is J. F. Libsch, chapter chairman. As president of A.S.M., Mr. Jominy reported on the excellent financial position of the Society and discussed a few future aims. As the evening's technical speaker, he discussed one of his pet subjects under the title "Tempering as Affected by Hardenability". Chairman Libsch announced a lecture series on "Selection and Application of Metallic Materials" to cover five successive weekly meetings. (Reported by William J. Murphy, Lehigh University)

Marform Process Reduces Number of Draws in Metal Forming Operations

Reported by M. J. Weldon

Henry G. Thompson & Son Co.

Members of the New Haven Chapter were treated to an unusual approach to the problems concerning deep drawing of metals when J. V. Bertrand, director of research and development of Hydropress, Inc., presented a description of the Marform process on Feb. 15.

The speaker outlined the history of metal forming, showing that man has continued to hammer away at parts impossible to finish by other methods. He then developed the history of the Marform process, which retains the best features of the steel punch and die method with the economical advantages of the Guerin or rubber-pad forming process. Its successful application in the aircraft industry was illustrated by slides and movies.

Since the components of Marforming consist of the punch and blankholder ring only, retooling is simplified and short-run operations are readily controlled.

The piece of metal is first locked against the punch thus obviating a concentration of stresses at the punch radius. Because of the fluid action of the rubber, parts heretofore drawn in three or four operations may now be drawn in a single operation with freedom from surface wrinkles and with a resulting high degree of thickness uniformity. A depth of draw in the order of 2.5 times the punch radius is general practice. Parts having coated finishes may be readily drawn without disturbing the finish.

Applications of the process to standard operations with aluminum, copper, low-alloy and stainless steel were described by Mr. Bertrand.

Past President Speaks on Stainless

Francis B. Foley of International Nickel Co., the Speaker; Robert T. Hill, Superintendent of Electric Furnaces, Sharon Steel Corp., Technical Chairman; and Phillip Connor, Chief Metallurgist, Sharon Steel Corp., Talk Things Over at the Mahoning Valley Chapter. Mr. Foley spoke on "Stainless Steels Today". (Photo by Henry Holberson, vice-chairman)

Reported by Eugene M. Smith
Youngstown Sheet and Tube Co.

Francis B. Foley, in charge of the steel section of International Nickel's research laboratory in Bayonne, and an A.S.M. past president, spoke on "Stainless Steels Today" at the Feb. 13th meeting of the Mahoning Valley Chapter A.S.M.

After reviewing the historical development of the 18-8 type stainless steels, the speaker described the methods employed to stabilize this material for use in corrosive environments. Three general methods can be adopted for avoiding embrittlement. Two are chemical in nature—formation of ferritic phase by addition of Mo or Si, or formation of insoluble carbides by addition of Cb or Ti, while the third is by heat treatment—formation of spheroidized carbides by heating at 1650° F.

Formation of ferritic areas breaks up the continuity of the carbide in the grain boundaries. Molybdenum—both a carbide and ferrite former—is doubly effective. Columbium, because of its scarcity, is being supplanted by titanium, although it provides better recovery and somewhat better control. New complex nonferrous alloys containing up to 4% Cb are used in making rotor blades and wheels for jet engines and in exhaust systems. As a result very little, if any, columbium will be available for addition to stainless.

Potentialities obtainable from cold working the austenitic stainless steels were indicated by graphs. These showed that rolling at −105° F. and −320° F. increases the tensile strength and elongation over that obtained with equivalent reduction at room temperature. As a result of a more uniform distribution of strain, strip can be formed into component parts at set atmospheric temperature without the danger of cracking or orange peeling which occur at higher temperatures. Mr. Foley emphasized the implications of the distinctly different manner in which elongation is manifested when stress is applied at low temperatures.

The speaker then explained the occurrence, control and effect of sigma phase. Charpy impact values and magnetic permeability are two properties that will indicate the presence of sigma. Murakami's reagent is useful in its identification, as well as carbides in microscopy. Strains induced by cold working or other local deformation can initiate the formation of sigma. It is postulated that formation of carbides may cause sufficient local stress to provide impetus to sigma transformation.

Four certificates commemorating 25 years of membership in the society were presented by William Baumgarten, chapter secretary.

Jominy at Milwaukee

Reported by Edward Rupert
Metallurgist in Charge
Heat Treating Section
Allis-Chalmers Mfg. Co.

Milwaukee Chapter A.S.M. was honored at the Jan. 23rd dinner meeting with the presence of the national president of the Society, Walter E. Jominy, staff engineer for Chrysler Corp.

Mr. Jominy presented 25-year membership certificates to four new silver jubiliarians, and then gave an excellent and informative talk on "Reducing Wear by Proper Metallurgy". This subject is being presented by the president before various other chapters during the current season.

Los Alamos Reports Successful Half-Year

Reported by D. T. Doll
Los Alamos Scientific Laboratory

The 1950-51 program of the Los Alamos Chapter began on Sept. 8 with a technical talk on "Instrumentation in Metallurgical Research" by R. H. Muller. Dr. Muller is a member of the faculty of New York University and has been associated with the Los Alamos Scientific Laboratory as a consultant since 1948.

He described the construction, operation and uses of a variety of new instruments and explained the techniques which have been developed to measure small differences in one or more variables. The use of chromophotography for the detection of metals was described and illustrated by a number of colored slides.

On Oct. 6, the A.S.M. and the Society for Non-Destructive Testing held a combined meeting at which W. E. Thomas spoke on "Methods of Nondestructive Testing." Mr. Thomas is vice-president in charge of sales for the Magnaflux Corp. and also vice-president of S.N.D.T.

The speaker evaluated the factors involved in nondestructive testing and reviewed the various methods in use, particularly the magnetic techniques.

Henry Hausner of Sylvania Electric Products Co. spoke at the November meeting on "Powder Metallurgy as a Tool in Research." Dr. Hausner enlarged upon the many variables involved in the preparation of a powder compact. He also told how a binary system involving a refractory metal is investigated.

The talk was well illustrated with slides and provoked a lively question-and-answer period.

Dr. Hausner also spoke to a group of A.S.M. members in Albuquerque on the production phase of powder metallurgy. From the number attending the talk and the interest shown, a new A.S.M. Chapter in Albuquerque may be well on the way.

Seventy-three members, wives and guests of the chapter got together for a Christmas party on Dec. 16 featuring "A Night at Monte Carlo" as the theme. A fortune passed over the roulette, dice and card tables, and prizes rewarded the winners.

One of the best-attended meetings of the year was held on Feb. 2, when Vincent T. Malcolm, director of engineering research and development, Chapman Valve Mfg. Co., spoke on "Modern Methods of Testing and Inspection." Mr. Malcolm has extensive industrial engineering experience as well as service as a consultant for the Army, Navy, W.P.B., and Manhattan Engineering District. It might be added that he has added ability as an after-dinner speaker.

Powder Metal Process Has Four Basic Phases, Engineering Details Given

Reported by L. F. Janssen
John Deere Des Moines Works

Speaking on the general subject of "The Powder Metal Process for High Production Items" before the Des Moines Chapter A.S.M. in January, L. G. Klinker, chief engineer, Metals Refining Co., Hammond, Ind., pointed out that there are four basic phases in the powder metallurgy process—formulation (including mixing of raw materials), briquetting (pressing), sintering, and sizing (coining). Metals commonly employed are copper, tin and iron. A mixture of 75% iron and 25% copper is often used in an effort to cut cost as compared to 90% Cu, 10% Sn bronze, another common alloy. Many satisfactory parts may be produced from this combination of metals.

During the mixing operation, lubricants such as stearates and graphite are added, not only to facilitate removal of the briquette after pressing, but also to provide a self-lubricant when the part is in service.

Various types of presses are utilized in making briquettes. The pressures applied normally vary from 40,000 to 80,000 psi. These high pressures indicate that the size of parts which may be fabricated by powder metallurgy is limited by the size of presses available, a factor which must be kept in mind when undertaking a powdered metal program.

The simplest setup is one in which pressure is applied from one end of the part only. This is not a very desirable arrangement, since the powder does not flow as a liquid, and pressures are distributed quite unevenly. This problem is overcome by using a double-acting press which applies pressure to both top and bottom of the part. Still more desirable is an adjustable die used with a double-acting press. This provides for the necessary adjustment when density of the powder varies.

Sintering is generally done at approximately 2050° F. for iron base materials and 1525° F. for copper. During this operation the process of diffusion welds the adjacent particles together. This is followed by a "coining" operation; if close tolerances are required, additional pressing and "sizing" are done after sintering.

The minimum corner radius for a powdered metal part should be approximately 0.010 in. Chamfers at corners and edges are desirable. Reentrant angles are not permissible. Minimum wall thickness is approximately 1/32 in.

Considerable data on die design for both briquetting and sizing was given, and slides were used to explain engineering details of presses, dies, furnaces, atmosphere equipment and miscellaneous auxiliary machines.

World Congress Director in Italy

Zay Jeffries (Second From Left) Is Greeted at the Station in Milan by Alessandro Reggiori, Oscar Masi and Leno Matteoli. The Italian city was one stop during Dr. Jeffries' recent European tour laying the groundwork for the World Metallurgical Congress to be held in this country next fall (see story on page 5). Messrs. Reggiori and Matteoli, both A.S.M. members, are with Istituto Scientifico Ernesto Breda; Mr. Reggiori is director of research and Mr. Matteoli is assistant director

HERE'S HOW . . .

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METALS REVIEW
7301 Euclid Avenue Cleveland 3, Ohio

Metal Progress Adds Two to Sales Staff

Two new appointments to the business staff of *Metal Progress* have been annouced by the American Society for Metals as a part of the expansion program inaugurated in January.

Harry Gebauer, as one of the eastern representatives, will cover the New England states, New York State and part of the New York metropolitan area, while Ralph H. Cronwell has been named as representative in the Chicago area. In New York, John F. Tyrrell, whose appointment was announced in February, will represent *Metal Progress* in the metropolitan New York area and in the east coast states to the south, including eastern Pennsylvania.

Mr. Gebauer was a sales representative for Reynolds Metals Co. in New York and New Jersey following service with the Air Corps (1942-44). He was sales engineer for the Foxboro Instrument Co. in 1944-45, and was selected to open the Cleveland office of Kaiser Aluminum and Chemical Corp., where he remained until joining Hamilton Steel Co. as sales manager of the aluminum division in Cleveland in 1948. He is a graduate of William and Mary College.

The eastern sales division of *Metal Progress* is occupying new quarters at 55 West 42nd St., New York City.

Mr. Cronwell's experience in the metalworking field began with Carnegie-Illinois Steel Corp. in 1940. He was in the U.S. Army Ordnance from 1941 to 1946. Since then he served with Fuller & Smith & Ross and Scully-Jones Co., and more recently with Industrial Publishing Co., Chicago. He will maintain headquarters at 1854 Burton Ave., Highland Park, Ill.

See Operation of Cutters And Dies for Plywood

Reported by William Galt

Plant Superintendent
Canadian Sumner Iron Works, Ltd.

A field visit to the plant of Western Plywood Co., Ltd., in January provided a highly instructive and educational evening for the members of the British Columbia Chapter A.S.M. Thanks to the kindness and hospitality of John Bene, president of the company, the party was able to inspect the many complicated processes and important side issues involved in the production of a plywood board.

Of particular interest to the members were the maintenance and sharpening arrangements for the knives, cutters, saws and wood-cutting dies. For example, special stellite-treated tool bits are used to remove the bark in the "mechanical log barker". Cutting lathes or "peelers" are used to peel the log into sheet wood or veneer. The veneer sheets are cut, stacked, glued and hot pressed, then dried and cut to size. The latter operation is performed on trim saws with carbide-tipped teeth to withstand the hardness of the glue. Sanding and inspection are the final operations on the finished plywood.

Explains Five Methods of Flaw Detection

At a Joint Meeting of the Golden Gate Chapter with the Society for Non-Destructive Testing Are Wally Erichsen of Westinghouse Electric Corp., A. S. M. Vice-Chairman; Donald Erdman of Electro Circuits Co., the Speaker; Harry Lewis of Pyromet Co., Chapter Chairman; Walter Grothe, Retired, Formerly of Caterpillar Tractor Co., a 25-Year Member; and Ben Berlien of Industrial Steel Treating Co., a Past Chapter Chairman

Reported by George H. Thurston

Benicia Arsenal

The five principal methods of nondestructive flaw detection were lucidly explained by Donald C. Erdman of Electrocircuits Co., speaking before a joint meeting of the Golden Gate Chapter A.S.M. and the Bay Area Chapter of the Society for Non-Destructive Testing. These five types are penetrant methods, mass spectrography, magnetic methods, radiographic, and ultrasonic methods.

Penetrant methods are applicable only where flaws reach the surface, the speaker explained. This method is the simplest and may be a valuable timesaver, even when other methods are prescribed.

Mass spectrography, by reason of its "astronomic sensitivity", will detect leaks which defy other methods.

Magnetic methods can be applied to both magnetic and nonmagnetic materials. The well-known Magnaflux is particularly adapted to magnetic parts of complicated shape. The Probolog for detecting flaws in tubes is sufficiently sensitive to reveal grain structure changes as well as discontinuities. It is applicable only to nonmagnetic materials. A similar device has been developed at Watertown Arsenal to locate cracks in rifle barrels. The Cyclograph compares a large number of similar parts to a standard part by means of the magnetic permeability at various frequencies, and is used, among other purposes, to check depth of case.

Radiographic methods were used extensively during World War II. Automatic operations reduced costs to about 50 cents per casting. Xeroradiography, which substitutes paper for film, still further reduces the cost. A recent development by Triplett and Barton is a high-power portable unit about 14 in. diameter by 3 ft. long for use in close quarters such as submarine interiors. Radioactive cobalt gives results at lower cost than radium, but has the disadvantage of emanating over a wide band of wave lengths and not from a point source.

Ultrasonic methods are of three types: transmission, resonance and reflection. The first type utilizes two crystals, a transmitter of high-frequency pulsations and a receiver. Discontinuities do not transmit the waves and therefore cast shadows. The Brush Hypersonic unit is an example. The second type uses the ultrasonic resonance principle and requires access to only one side of the tested material. Both of these ultrasonic methods have certain disadvantages in that some nonflaw conditions give the same indications as flaws.

The third ultrasonic principle is by reflection or echo. This is embodied in the Sperry Reflectoscope and in Electro Circuits' "automatic ultrasonic flaw mapping device". Features of the latter instrument are total immersion in a liquid and a relatively great distance from crystal to object surface. On jet engine turbine rotor disks three orthographic views of flaws are produced in 10 min. on a film. The echo method determines depth of discontinuities as well as projected location.

Ultrasonic methods will detect flaws 1/32 in. in diameter and immeasurably thin—of the order of 0.00001 in. or less.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor
Assisted by Pauline Beinbrech, N. W. Baklanoff, Fred Rothfuss, and Leila M. Virtue

A GENERAL METALLURGICAL

73-A. Both as Producer and Consumer. J. E. Eberhardt. *Chemical and Engineering News*, v. 29, Feb. 19, 1951, p. 644-646.
Problems of the steel industry varying from raw materials to sales which a cooperative and research-minded chemical industry can help to solve. (A9)

74-A. The Successful Attack. Hamnett P. Munger. *Chemical and Engineering News*, v. 29, Feb. 19, 1951, p. 647-649.
Results of research by chemists and chemical engineers on problems of steel producers include flotation reagents, removal of sulfur from coke-oven gas, uses of oxygen, mold coatings, core binders, palm-oil substitutes for cold rolling, rust-preventive oils, phosphate coatings, descaling stainless steel, salt baths and liquid carburizers, quenching oils, organic finishes, metal-bonding adhesives, porcelain enamels, etc. (A9)

75-A. Hooded Machines Run Toxic and Radioactive Jobs. S. S. Gold. *American Machinist*, v. 95, Feb. 19, 1951, p. 133-135.
Hooded machine tools equipped with exhaust systems for toxic fumes and dusts and with collectors for chips and turnings. They were developed at Argonne National Laboratory. (A7, G17, EG-h)

76-A. Metals in Review. *Engineering and Mining Journal*, v. 152, Feb. 1951, p. 74-97.
Consists of the following articles surveying economic developments and trends of the past year: "Gold", M. A. Kriz; "Silver", Dickson H. Leavens; "Copper", H. H. Wanders; "Lead", Robert L. Ziegfeld; "Zinc", Charles R. Ince; "Tin", H. H. Wanders; "Light Metals", Richard J. Lund; "Minor Metals", Charles White Merrill; "Cobalt", Hubert W. Davis; "Antimony", Arnold S. Kemp; "Bismuth", Arnold S. Kemp; "Cadmium", Richard H. Mote; "Arsenic", Arnold S. Kemp; "Beryllium", Jack W. Clark; "Mercury", Helena M. Meyer; "Platinum-Group Metals", Hubert W. Davis; "Titanium", Frank J. Cservenyak; "Magnesium" (anon.); "Chromite", Norwood B. Melcher; "Manganese", Norwood B. Melcher; "Molybdenum", Robert W. Geehan; "Nickel", Hubert W. Davis; and "Tungsten", Robert W. Geehan. (A general)

77-A. Gas-Fired Furnaces. Installations at the Rogerstone Works. *Metal Industry*, v. 78, Feb. 2, 1951, p. 83-85, 87.
Use in various phases of aluminum fabrication at British plant. (A5, F general, G general, Al)

78-A. How G.E. Makes Turbojets. E. J. Tangerman. *American Machiinst*, v. 95, Feb. 5, 1951, p. 135-154.
Unusual operations in the manufacture of the J-47 turbojet. Steps in the process which represent advanced practice applicable also to other products in other plants. Includes forging, press operations, pickling, inspection, welding, machining operations, and assembly. (A5, T25)

79-A. Sparking Magnesium. Allen S. Russell. *Metal Progress*, v. 59, Feb. 1951, p. 228-231.
A black coating occasionally found on magnesium ingots may spark and burn violently when hit or scraped against another ingot. The active agent has been identified as an intimate mixture of metal and sulfur, the latter being formed from the SO_2 atmosphere used to prevent burning of the Mg. Possible hazard of the phenomenon. (A7, Mg)

80-A. Researchers in Metallurgy. Will Vandermeer. *Western Machinery and Steel World*, Feb. 1951, p. 64-67.
Facilities and work of Ryan Aeronautical Co.'s engineering laboratory. (A9)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

81-A. The South's Research Resources. R. A. Morgen. *Journal of Southern Research*, v. 3, Jan.-Feb. 1951, p. 6-14.
Includes "First Annual Directory of Southern Research Services and Facilities." (A9)

82-A. ARI's Burton Says: Scrap Disposal Plan Menacing Aluminum Smelters and Foundries. *Modern Metals*, v. 7, Feb. 1951, p. 44, 46.
Testimony of Carl H. Burton, secretary of the Aluminum Research Institute at Hearings on Monopoly in Aluminum held by the House Subcommittee on Monopoly Power. (A4, A8, Al)

83-A. Standards Bureau Marks Half-Century. E. E. Halmos, Jr. *Engineering News-Record*, v. 146, Mar. 8, 1951, p. 32-34.
Activities and mode of operation of National Bureau of Standards. (A9)

84-A. Economic Uses for Metallurgical Slags. Leslie Bor. *Mining Magazine*, v. 84, Feb. 1951, p. 84-86.
Mechanical and chemical uses. (A8)

85-A. Annual Review: Nonferrous Metals. Simon D. Strauss. *Mining Engineering*, v. 190, Feb. 1951, p. 110-112.
Surveys economic status and trends. (A4, EG-a)

86-A. Annual Review: Geology is Still the Key to Mineral Supplies. Roger H. McConnel. *Mining Engineering*, v. 190, Feb. 1951, p. 113-117.
New discoveries and developments of 1950 in metallic and nonmetallic minerals. (A4, B10)

87-A. A Review of World Coal and Iron Ore Resources and Their Utilization for Manufacture of Steel. Part I. W. C. Rueckel. *Blast Furnace and Steel Plant*, v. 39, Feb. 1951, p. 195-199.
Introduction plus data on the world's coal and iron-ore reserves. (To be continued.) (A4, B10, ST)

88-A. Chemistry of Waste Cyanide Treatment. David Milne. *Sewage and Industrial Wastes*, v. 23, Feb. 1951, p. 174-180.
Classifies reaction in which cyanides may be involved; classifies available treatment methods under the appropriate equilibrium system; and reviews each equilibrium system for other reactions of possible use as treatment methods for cyanides. (A8)

89-A. Waste Pickle Liquor Disposal in Molten Blast Furnace Slag. S. S. Heide. *Steel Equipment & Maintenance News*, v. 4, Feb. 1951, p. 8-9.
Patented process in which the pickle liquor is absorbed by bringing in contact with molten slag. The dried slag is crushed and used as a fertilizer ingredient. Several hundred tons have been successfully produced. (A8, Fe)

90-A. Metal Tariffs Do Not Act as Import Barrier; Current Duties Viewed as Extremely Modest. Felix Edgar Wormser. *Metals*, v. 21, Mar. 1951, p. 7-8, 12.
(A4)

91-A. Canadian Nickel Available for Stockpiling; Distribution in 1950 Sets Peace-Time Peak. John F. Thompson. *Metals*, v. 21, Mar. 1951, p. 9, 15.
Production and supply situation. (A4, Ni)

92-A. Current Zinc Shortage Raises Questions—Where are Supplies? Why Not Boost Output? Ernest V. Gent. *Metals*, v. 21, Mar. 1951, p. 10, 12.
(A4, Zn)

93-A. Copper. C. H. Winship, Jr. *Mining Congress Journal*, v. 37, Feb. 1951, p. 50.
Economic developments and trends. (A4, Cu)

94-A. Lead in 1950. Gloyd M. Wiles. *Mining Congress Journal*, v. 37, Feb. 1951, p. 51-52.
Economic developments and trends. (A4, Pb)

95-A. Zinc. R. J. Mechin. *Mining Congress Journal*, v. 37, Feb., 1951, p. 53-54.
Economic developments and trends. (A4, Zn)

96-A. Iron Ore. William S. Cumings. *Mining Congress Journal,* v. 37, Feb. 1951, p. 59-61.
Production data for 1950 for various districts in the U. S. and abroad. (A4, Fe)

97-A. Domestic Supplies of Strategic Minerals. David D. Baker. *Mining Congress Journal,* v. 37, Feb. 1951, p. 69-70, 76.
Surveys supplies of Mn, Cr, V, Mo, W, Co, Ni, Sb, Hg, and Ti. (A4, B10, EG-a)

98-A. Silver. Pat McCarran. *Mining Congress Journal,* v. 37, Feb. 1951, p. 104-105.
Present economic status and possible governmental actions. (A4, Ag)

99-A. Chromium Salvage. *Chemical Industries Week,* v. 68, Mar. 3, 1951, p. 21, 23.
How Cr-containing ions can be recovered economically from anodizing, electroplating, and copper stripping baths. (A8, L general, Cr)

100-A. Pickle Liquor Disposal Can Pay Off. F. D. Jones, *Iron age,* v. 167, Mar. 8, 1951, p. 88-91.
Methods for disposal and recovery of valuable by-products. Waste pickle liquor from the pipe mill is reacted with zinc wastes from the galvanizing shop. Zinc sulfate, zinc chloride and iron hydrate pigment are produced. (A8, Zn)

101-A. Wilson Puts the Brakes on Granting Certificates of Necessity for Expansion of Steel Industry. *Iron Age,* v. 167, Mar. 8, 1951, p. 110-111.
Includes tabular list of all Certificates of Necessity issued through Jan. 30, 1951. Defense Mobilizer C. E. Wilson believes that contracts already placed and the production potential of the expanded steel industry will be ample to meet requirements up to 1953. (A4, ST)

102-A. Cyanide Waste Disposal and Control. C. F. Hauri. *Plating,* v. 38, Mar. 1951, p. 240-242, 265.
Procedures of Delco-Remy Div., General Motors Corp., Anderson, Ind. (A8)

103-A. Steel Catches Up. *Fortune,* v. 43, Mar. 1951, p. 68-71, 127-128, 130, 132, 134, 137.
Surveys steel capacity of the U. S., the Free Nations, and the Soviet Bloc. Indicates that there will be enough for mobilization, but not for isolation. (A4, ST)

104-A. Mineral Production Substantial Gain in 1949. Harold MacLeod. *Canadian Mining Journal,* v. 72, Feb. 1951, p. 56-65.
Canadian statistics. (A4)

105-A. Literature. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 381-385.
Includes 13 references on fine structure and metal physics, 23 on general metallurgy, 18 on strength characteristics and materials testing, 6 on corrosion, and 12 on analyses. 72 ref. (A general)

106-A. More About Air Pollution Problems. Meteorological Conditions Affecting Air Pollution. A. H. Eichmeier. **Testing Procedures and Equipment.** George E. Tubich. **Toxic Gases; Effect on Plant Life.** Forrest C. Strong. *American Foundryman,* v. 19, Mar. 1951, p. 51-57.
Concludes series presented at the 1950 Michigan Regional Foundry Conference, Nov. 10-11, 1950. (A7, E general)

107-A. The National Bureau of Standards and Its International Relations. Wallace R. Brode. *Foreign Commerce Weekly,* v. 42, Mar. 12, 1951, p. 3-4, 27.
Cooperative work with foreign research agencies and as U. S. representative in exchange of technologic information, and in establishment and definition of scientific standards. (A9, S22)

108-A. Redesigning a Secondary Smelting Plant. Earl R. Marble, Jr. *Journal of Metals,* v. 3, Mar. 1951, p. 218-222.
The Newark, N. J., plant of American Smelting and Refining Co., makes Sn and Pb-base alloys from both scrap and primary metals, and Zn-base die-casting alloys. Includes furnace charge preparation, dross smelting, furnace flue system and gas handling, dust recovery and treatment, refining furnace metals, processing refined metal, utilities, services and safety, welfare, and employment. (A8, C general, Sn, Pb)

109-A. Chemical and Physical Aids to Iron and Steel Research. *International Chemical Engineering and Process Industries,* v. 32, Feb. 1951, p. 76-77.
Current work at the Physics Laboratories of the British Iron and Steel Research Assn. (A9, Fe, ST)

110-A. The Australian Silver-Lead-Zinc Industry. L. A. Lyons. *Mine & Quarry Engineering,* v. 17, Mar. 1951, p. 77-85.
An illustrated statistical survey. (A4, Ag, Pb, Zn)

111-A. Aluminium Supply and Demand. *Metallurgia,* v. 43, Feb. 1951, p. 65-66.
Present British position. (A4, Al)

112-A. (Book). **Economics of American Industry. Ed. 2.** E. B. Alderfer and H. E. Michl. 716 pages. 1950. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $5.50.
Revised and brought up to date. Includes technological and structural changes which have taken place since the first edition was published in 1942. Industries included are: metal and metal fabricating, nonmetallic minerals, chemicals, petroleum, rubber, textiles, apparel, food, etc. Latest available data to indicate changes in productive capacity, shifts in location, development of new industrial areas, and additional manufacturing facilities. (A4)

113-A. (Book) **52nd Annual Report Mining Industry of the State of Idaho for 1950.** 256 pages. State of Idaho, Boise, Idaho.
Safety programs, accidents, wage rates, and the outlook for different nonferrous metals. Includes a 30-page bibliography on Idaho's mineral resources. (A4, B10, B12, EG-a)

B

RAW MATERIALS AND ORE PREPARATION

50-B. Revived Processes Challenge Flotation's Thirty-Year Rule. R. H. Ramsey. *Engineering and Mining Journal,* v. 152, Feb. 1951, p. 116-118.
Recent developments in ore preparation and beneficiation, including revival of interest in such processes as leaching. (B14)

51-B. Huge Expansion in Prospect for Iron Ore Beneficiation. L. A. Roe. *Engineering and Mining Journal,* v. 152, Feb. 1951, p. 119-121.
New technical developments and commercial plants. (B14, Fe)

52-B. The Extraction of Uranium. *Chemical Age,* v. 64, Feb. 3, 1951, p. 214-215. (Condensed from paper by F. W. McQuiston, Jr., *South African Mining and Engineering Journal,* v. 61, pt. 2, No. 3021.)
(B14, U)

53-B. Crushing Practice and Theory. Brownell McGrew. *Rock Products,* v. 54, Feb. 1951, p. 106-107, 122-123.
High and low-speed products; effects on reduction ratio; kind of feed; effect of feed gradation; and choke-feed vs. regulated feed. (B13)

54-B. Annual Review: Beneficiation in 1950. Grover J. Holt. *Mining Engineering,* v. 190, Feb. 1951, p. 122-125.
New developments. (B14)

55-B. Pure Oxide Refractories. D. Kirby. *Refractories Journal,* v. 27, Jan. 1951, p. 11-14.
Formulation and applications. (B19)

56-B. Krupp-Renn Tests on French Minette Ore. P. E. Henry, C. F. Ramseyer, and J. R. Miller. *Iron and Steel Engineer,* v. 28, Feb. 1951, p. 66-78.
Details of the process, including equipment diagrams. It was developed in Germany in the early 1930's. Claims that it has possibilities for ore beneficiation which may make it fit in with conventional iron-making procedures. A cost analysis of possibilities of adaptation to American conditions. (B13, Fe)

57-B. There's Big Ceramic Potential in the New, Unusual Silicon Carbide. *Brick & Clay Record,* v. 118, Mar. 1951, p. 62-63.
Refractory composed of a network of SiC embedded in Si metal which possesses a unique combination of properties which make it highly suitable for ceramic-plant use in muffles, kiln furniture, and heating elements. (B19, T5, Si, C-n)

58-B. Rare Earth, Inc., Redredges Idaho Gold Placer for Monazite. Walter Hovey Hill. *Mining World,* v. 13, Feb. 1951, p. 12-14.
Includes concentration flowsheet. (B12, B13, Th)

59-B. Ima Tungsten—Pre - Korean Development Proves Boon to Preparedness Drive. *Mining World,* v. 13, Mar. 1951, p. 10-13, 81.
Mining and beneficiation procedures at Ima mine and mill of Bradley Mining Co., in Idaho. Includes flowsheet. (B12, B14, W)

60-B. Use of Magnetic Ores From New York State. K. G. LeVisuer. *Blast Furnace and Steel Plant,* v. 39, Feb. 1951, p. 200-202, 222.
Economic and technological factors on the basis of experiences of Republic Steel Corp. Includes beneficiation, sintering, and use in the blast furnace and openhearth. (B14, B16, D1, Fe)

61-B. New Mill Treats Gold Ores of Colorado's Cripple Creek District. *Skilling's Mining Review,* v. 39, Mar. 10, 1951, p. 1.
Briefly described. (B13, B14, Au)

62-B. Advances in Mineral Dressing. Strathmore R. B. Cooke. *Mining Congress Journal,* v. 37, Feb. 1951, p. 47-49.
Annual review. (B14)

63-B. AEC Raw Materials Program. *Mining Congress Journal,* v. 37, Feb. 1951, p. 86-89.
Trends and general status of the domestic raw-materials program for atomic energy. Areas and types of deposits on which major domestic exploration efforts have been expended. A few of the new developments. (B10, U)

64-B. An Appraisal of the Iron-Ore Resources of the World. John W. Gruner. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 4-15, disc. p. 15-17.
Regions of the U. S. and countries of the different continents. 18 ref. (B10, Fe)

65-B. Fundamental Factors Influencing the Strength of Green and Burned Pellets Made From Fine Magnetite-Ore Concentrates. M. Tigerschiold and P. A. Ilmoni. *American Institute of*

Mining and Metallurgical Engineers, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 18-45; disc. p. 46-53.

Experimental procedure, apparatus, and iron-ore concentrates used. 10 ref. (B16, Fe)

66-B. Pelletizing of Iron-Bearing Fines by Extrusion. P. E. Cavanagh. *American Institute of Mining and Metallurgical Engineers*, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 54-72; disc. p. 72-80.

A vacuum-extrusion machine which provides a simple and cheap method of pelletizing all types of ores, both swelling and nonswelling. Pellets can be charged in the air-dried state, without burning. Development of techniques for plasticizing and binding sandy types of ores. (B16, Fe)

67-B. Present Method of Grading and Grouping Iron Ores. N. H. Thomas. *American Institute of Mining and Metallurgical Engineers*, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 187-193; disc. p. 193-194.

Methods of sampling and materials handling. (B11, Fe)

68-B. Beneficiation of Adirondack Magnetite. W. R. Webb and R. G. Fleck. *American Institute of Mining and Metallurgical Engineers*, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 220-230; disc. p. 230-236.

Previously abstracted from *Mining Engineering*. See item 192-B, 1950. (B16, Fe)

69-B. Operating Practices at the Portsmouth Sinter Plant. Guy B. Hunner. *American Institute of Mining and Metallurgical Engineers*, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 236-241; disc. p. 241-245.

Previously abstracted from *Journal of Metals*. See item 99-B, 1950. (B16, Fe)

70-B. Swedish Sintering Practice—The Holmberg System. A. W. Robinson. *American Institute of Mining and Metallurgical Engineers*, "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 246-258; disc. p. 258-267.

(B16, Fe)

71-B. Flotation. H. R. Spedden. "Encyclopedia of Chemical Technology," *Interscience Encyclopedia* (New York), 1951, p. 595-614.

A general discussion. 22 ref. (B13)

72-B. Non-Ferrous Metals; Extraction and Refining (Excluding Electro-Metallurgy). S. W. Smith. *Reports on the Progress of Applied Chemistry*, v. 34, 1949, p. 138-151.

Reviews methods by metal. 93 ref. (B general, C general, EG-a)

73-B. Concentrating Operations of the Yunnah Consolidated Tin Corp., Kochiu, Yunnan, China. T. T. Ni and Shiou-Chuan Sun. *Canadian Mining and Metallurgical Bulletin*, v. 44, Feb. 1951, p. 74-77; *Transactions of the Canadian Institute of Mining and Metallurgy*, v. 54, p. 40-43.

Mining and smelting, mineralogy, mill flowsheet, desliming, tabling, and cleaning of table concentrate. (B14, Sn)

74-B. Madsen Milling Practice. L. H. Van Loon. *Canadian Mining and Metallurgical Bulletin*, v. 44, Feb. 1951, p. 105-113.

Crushing, conveying, grinding, thickening, cyanidation, classification, tabling, amalgamation, etc., at Madsen Red Lake Gold Mines, Ltd. (B13, Au)

75-B. Chromium-Silicon Alloys in the Manufacture of Stainless Steels; A New Technique of Slag Reduction Developed in Sheffield. D. J. O. Brandt and W. H. Everard. *Edgar Allen News*, v. 29, Feb. 1951, p. 781-784.

Previously abstracted from *Metal Treatment and Drop Forging*. See item 8-B, 1951. (B22, D5, SS, Fe-n)

76-B. The Smidth Agglomerating Kiln; Plant and Practice at East Moors Works, Cardiff. W. E. Simons. *Journal of the Iron and Steel Institute*, v. 167, Jan. 1951, p. 1-8.

The rotary kiln provides an alternative method to sintering for the treatment of fine iron ores and flue dust. Construction of a particular rotary kiln and layout of the plant. Operating procedure. Analyses of the raw materials and of finished agglomerate. Use of the agglomerate in the blast furnace. Advantages and disadvantages of the rotary kiln. (B16, Fe)

77-B. Action of Gases and Reagents on Minerals During Flotation. (In Russian.) I. N. Plaksin. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Dec. 1950, p. 1827-1843.

Influence of contact angle and bubble dimensions on force of adhesion of particles to it; changes of contact angle with time; influence of gas sorption on the surface of particles and chemical reactions of gases, especially oxygen, with the minerals; conditions of bubble formation at the liquid-solid interface; influence of reagents on contact angle and speed of adhesion; and mechanism of mineralization of bubbles in the pulp and in the froth. 29 ref. (B14)

78-B. Thermodynamics and Slag Structure. (In Polish.) Julian Kamecki. *Hutnik*, v. 17, July-Aug. 1950, p. 190-195.

Thermodynamics of slag formation during smelting of iron ore and during refining of steel on the basis of the literature and the author's investigation. Crystal structure of the slag is analyzed. 16 ref. (B21, D general, P12, ST)

79-B. Control of Basicity of Open-hearth Slags on the Basis of Appearance of Solidified Samples. (In Polish.) Jerzy Zieba. *Hutnik*, v. 17, July-Aug. 1950, p. 196-204.

Control method, especially the sampling technique. Seven different types of slag having $CaO\text{-}SiO_2$ ratios varying from 1.25 to 4.40 were investigated. Fe contents ranged from 7.06 to 15.08%. Influence of composition on appearance and properties of solidified slags. Results indicate possibility of control of basicity by visual inspection of solidified samples. (B21, D2, ST)

80-B. Krupp-Renn Process Urged for Iron Ore Beneficiation. P. E. Henry, C. F. Ramseyer, and J. R. Miller. *Steel*, v. 128, Mar. 12, 1951, p. 92, 95, 98.

Nonmagnetic taconites can be beneficiated directly without magnetic roasting in rotary-kiln plant which raises the grade of iron from 28 to approximately 92-93%. Product is being successfully used in European blast furnaces. (B14, D1, Fe)

81-B. Universal Type Electrostatic Separator. Foster Fraas and Oliver C. Ralston. *U. S. Bureau of Mines*, Report of Investigations 4766, Feb. 1951, 4 pages.

Separator is provided with a dielectric electrode and permits formation of high-intensity static fields. Application to crushed ores, sands, and industrial products. (B14).

82-B. The Operation of Ball Mills. Douglas R. Channell. *Industrial Chemist and Chemical Manufacturer*, v. 27, Feb. 1951, p. 69-73.

Factors affecting the operation of ball mills together with graphs indicating suitable working conditions. (B13)

83-B. Gas and Coke in Aluminium Manufacture. *Coke and Gas*, v. 13, Feb. 1951, p. 68-72.

Use of coke-oven gas in the manufacture of Al at a British plant. (B18, Al)

84-B. (Book) Elements of Ore Dressing. Arthur F. Taggart. 595 pages. 1951. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16. $10.

Ore-dressing facts, empirical generalizations most used, tested theories in design and control of operations, laboratory instructions, and recent advances in fine crushing, grinding, dewatering, and sink-float concentrations. Review questions and a bibliography follow each chapter. (B13, B14)

85-B. (Book) Cyanidation and Concentration of Gold and Silver Ores. Ed. 2. John V. N. Dorr and Francis L. Bosqui. 509 pages. 1950. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $8.50.

Divided into two principal sections. Part I: unit processes employed in the cyanidation and concentration of ores together with the technical principles involved and equipment used in general practice. Special methods for the treatment of refractory ores, and the recovery of bullion from amalgamation and from cyanide solutions. Part II: plant descriptions and flowsheets, cost data and other metallurgical information reported from gold and silver mills throughout the world. (B general, Au)

C

NONFERROUS EXTRACTION AND REFINING

30-C. In Metallurgy, the Accent is on New Metals, New Methods. A. W. Schlechten and H. R. Hanley. *Engineering and Mining Journal*, v. 152, Feb. 1951, p. 122-125, 183.

Reviews new developments in production of nonferrous metals, and in their applications. (C general, T general, EG-a)

31-C. Continuous Cast Aluminum Bars Produced by the Properzi Process. D. I. Brown. *Iron Age*, v. 167, Feb. 15, 1951, p. 87-90; Feb. 22, 1951, p. 71-73.

Italian-made machine, which casts at a rate of 10-30 ft. per min., is simple in design and operation. Three men run the entire operation including the 15-stand continuous rolling mill which converts the cast section into coiled rod. It has been in use in this country since July 1950. Finished product has better than standard mechanical properties. Major use is for nails and manufactured wire products. (C5, Al)

32-C. The Dissociation of Beryllium Iodide in Platinum Containers. Bernard Kopelman and Harry Bender. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 89-93.

Equilibrium measurements were made in the range 575-1060° C. The measurements were only partly successful because of reaction of the vapor with the platinum. Dissociation constants and heat of dissociation of dimeric BeI_2 into its monomer were determined. The information was obtained to shed light on possible use of the iodide process for production of metallic Be. 11 ref. (C4, Be)

33-C. Influence of Vacuum Melting on the Properties of Ferrites Contain-

ing 25% Chromium. (In French.) J. Hochmann. *Bulletin du Cercle d'Etudes des Métaux,* v. 5, Sept.-Dec. 1949, p. 221-281.

A comprehensive review on the basis of the literature. Concludes that the method may be suitable for production, on a laboratory scale, of metals and alloys almost completely free of carbon, oxygen, and nitrogen. 46 ref. (C25, Fe-n)

34-C. Density of Fused Cryolite Electrolytic Baths for Aluminum Production. (In Italian.) A. Vajna. *Alluminio,* v. 19, No. 6, 1950, p. 541-547.

Methods for density determination indicating its importance for proper operation of the bath. Factors involved. (C23, Al)

35-C. Thermodynamic Analysis of Equilibrium Conditions During Reduction of Iron Chromite With Carbon. (In Russian.) P. V. Gel'd and O. A. Esin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Dec. 1950, p. 1260-1270.

Above reaction, which results in production of ferrochromium and CO, is of importance in the production of ferro-alloys. 18 ref. (C21, P12, Fe-n)

36-C. Kinetics of Reduction of Chromic Oxide and Iron Chromite. (In Russian.) P. V. Gel'd and O. A. Esin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 23, Dec. 1950, p. 1271-1276.

Reduction of chromic oxides with hydrogen and with carbon was experimentally investigated. Reduction with hydrogen was found to proceed much more slowly than with carbon. Increasing the fineness of graphite and chromite accelerates chromite reduction, which is also facilitated by additions of salts of alkali metals. 12 ref. (C21, Fe-n, Cr)

37-C. Mechanism of Oxidation of Cadmium Sulfide (In Russian.) D. M. Chizhikov, G. S. Frents, and B. Ya. Tratsevitskaya. *Izvestiya Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Dec. 1950, p. 1815-1826.

Experimental investigation showed that the primary oxidation product is $CdSO_4$, which may be reacted with the remaining CdS to give metallic Cd and SO_2. The latter products may also be formed by reaction of CdS and CdO. Conditions of temperature and pressure influencing both reactions were determined. Data and method of investigation. (C21, Cd)

38-C. El Paso Refinery of Phelps Dodge Refining Corporation. B. B. Kunkle. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 229-234.

A general flowsheet and descriptions of plant layout, operations involved, and equipment used at one of the world's largest and most modern electrolytic Cu refineries. (C23, Cu)

39-C. Mechanism of Oxidation of Cadmium Sulfide. (In Russian.) D. M. Chizhikov, G. S. Frents, and B. Ya. Tratsevitskaya. *Izvestiva Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Dec. 1950, p. 1815-1826.

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40-C. (Book) **World's Non-Ferrous Smelters and Refineries. Ed. 4.** H. G. Cordero, editor. 318 pages. 1950. Quin Press, Ltd., London, England. 25s. (C21, A4, EG-a)

D

FERROUS REDUCTION AND REFINING

91-D. Steel Ladle Refractories. Parts II and III. F. I. Cordwell. *Refractories Journal,* v. 26, Nov. 1950, p. 458-464; v. 27, Jan. 1951, p. 4-10.

Concludes review of recent technical progress. (D9, ST)

92-D. Statistical Analysis of Open Hearth Data. Wade R. Weaver. *Iron and Steel Engineer,* v. 28, Feb. 1951, p. 53-57; disc., p. 57-58.

Modern statistical tools available to the openhearth operator to help him in evaluating his operating data. (D2, S12, ST)

93-D. The Physical Chemistry of Steelmaking. Part II. (Concluded). Karl L. Fetters. *Industrial Heating,* v. 18, Feb. 1951, p. 265-266, 268, 274.

Research projects sponsored by various organizations, including the AISI, are reviewed. Results of this fundamental research and its advantages to the steel industry. (D general, P12, ST)

94-D. The Design of a New Open Hearth Shop. III. (Concluded). H. E. Warren, Jr. *Industrial Heating,* v. 18, Feb. 1951, p. 276, 278, 280.

Hot-topping facilities, cinder yard and skull crackers, strippers, fuel systems, instrumentation, and cooling. Information on yard track systems is included. (D2, ST)

95-D. Steelmaking for Castings. John Howe Hall. *Foundry,* v. 79, Mar. 1951, p. 98-99, 228-233.

Advantages and disadvantages of different steelmaking methods and equipment used in the foundry, including acid and basic electric furnace, side-blown converter, and openhearth. (To be continued.) (D5, D3, D2, CI)

96-D. European Research on Flame Radiation. Tom Bishop. *Metal Progress,* v. 59, Feb. 1951, p. 248, 249.

Research in Holland on design of openhearth furnaces and boilers for maximum radiation effect from a given flame. The work is being done cooperatively by scientists from France, Holland, Great Britain, and Sweden. (D2)

97-D. Finer Screening Ups Furnace Output 30 Per Cent. John D. Knox. *Steel,* v. 128, Mar. 5, 1951, p. 90, 99, 102, 105.

Summary of proceedings of blast-furnace session of the annual winter meeting of the Eastern States Blast Furnace and Coke Oven Assn., Pittsburgh, Feb. 16, 1951. (D1, Fe)

98-D. Application of Superimposed Precipitators. R. E. Touzalin. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 81-88; disc. p. 88-90.

Previously abstracted from *Journal of Metals.* See item 79-D, 1950. (D1, Fe)

99-D. Modern Blast-Furnace Gas Cleaning. G. P. Burks. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 91-98; disc. p. 98-103.

Previously abstracted from *Journal of Metals.* See item 147-D, 1950. (D1, Fe)

100-D. Gas-Washer Developments. Harry O. Johnson. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 104-110; disc. p. 110-111.

Stationary disintegrator gas washers at the Donora blast-furnace plant of the American Steel and Wire Co. (D1, Fe)

101-D. Disintegrators for Fine-Cleaning Blast Furnace Gas. Owen R. Rice and C. G. Bigelow. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 111-117; disc. p. 117-118.

Rotary disintegrators used by Freyn Engineering Co., Chicago. (D1, Fe)

102-D. Pig-Machine Practice at Hanna Furnace Corp. A. J. MacDonald. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 119-124; disc. p. 124-126. (D1, Fe)

103-D. The Pig Machine at Wisconsin Steel Works. R. P. Wheatley. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 127-129; disc., p. 129-130.

Layout. (D1, Fe)

104-D. Pig-Casting Practice at Woodward. H. A. Byrns. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 130-132; disc. p. 132-136.

Practice at Woodward Iron Co., Woodward, Ala. (D1, Fe)

105-D. Blowing Out Carbon-Hearth Furnaces. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 203-213; disc. p. 213-219.

"Data on Carbon Linings," C. G. Hogberg and "Progress Report on Causes of Failure of Carbon Hearths," H. M. Kramer. Operations at the following companies: Interlake Iron Corp., C. P. Johnson; Pittsburgh Steel Co., George D. Sells; Republic Steel Corp., H. F. Dobscha; Jones and Laughlin Steel Corp., H. P. Saxer; Bethlehem Steel Co., W. R. Zehner. (D1, Fe)

106-D. Use of Adirondack Sinter in Blast Furnaces. Elmer H. Riddle. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 268-277; disc. p. 277-280.

Previously abstracted from *Journal of Metals.* See item 76-D, 1950. (D1, Fe)

107-D. Lessons From a Hanging Blast Furnace. L. M. Fulton. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 280-292; disc. p. 292-297; 305-313.

Previously abstracted from *Journal of Metals.* See item 66-D, 1950. (D1, ST)

108-D. Conditions of Outstanding Blast-Furnace Operation. Kurt Neustaetter. *American Institute of Mining and Metallurgical Engineers,* "Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division," v. 9, 1950, p. 297-304; disc. p. 304-305.

Previously abstracted from *Journal of Metals.* See item 78-D, 1950. (D1, Fe)

109-D. Applications of the Statistical Analysis of Factors Affecting the Output of an Open-Hearth Furnace. P. Arnold and M. W. Thring. *Journal of the Iron and Steel Institute*, v. 167, Jan. 1951, p. 44-45.

A relation between carbon content of the fully melted steel, weight of oxygen required to oxidize C, Si, P, and Mn in the original charge, and rate of oxidation is derived. If a method of feeding the carbon black to the charge in soft melts were available, a 5% gain in output would result from reducing oxygen equivalent of the initial charge to give an average carbon at melt-out equal to the previous lowest permissible value. (D2, S12, ST)

110-D. Trials of an Experimental Austeel-Escher Metallic Recuperator. J. B. Davis, W. Ernest, and H. Kay. *Journal of the Iron and Steel Institute*, v. 167, Jan. 1951, p. 66-70.

Experimental procedure and some of the more important data obtained with recuperator developed originally in Australia. (D2, ST)

111-D. The Drying of Ironstone. R. C. Walthew. *Metallurgia*, v. 43, Jan. 1951, p. 29-30. (A condensation)

Practice of a British firm in drying two different types of iron ore before charging to the blast furnace. Partial drying is said to be advantageous for facilitating grading and handling. (D1, Fe)

112-D. The Control of Steel Quality. G. Reginald Bashforth. *British Steelmaker*, v. 17, Feb. 1951, p. 89-97.

Defects commonly experienced in steel production and treatment. Methods for the reduction or prevention of these imperfections. (D general, S12, ST)

113-D. Model Research; Applications in the Steel Industry. Frances Mortimer. *Iron and Steel*, v. 24, Feb. 1951, p. 39-44, 50.

Work on BISRA's 1/5-scale experimental openhearth furnace has been terminated. Work will be continued on smaller bench-size models, which can provide quickly, cheaply, and accurately the same information as the larger model, and the results can be applied directly to production furnaces. Past work and the various small and large models which have been investigated in Britain. Includes side-blown converters, blast furnaces, and gas producers. 20 ref. (D2, D1, D3, ST)

114-D. The Steel Melting Practice Adopted at Iscor Works, Pretoria. C. P. Warden. *Journal of the Chemical, Metallurgical and Mining Society of South Africa*, v. 51, Nov. 1950, p. 177-193; disc., p. 193-197.

Acid bessemer and the basic openhearth process, and method of slag control. Details of the duplex process; effect of duplexing on rate of furnace production. (D7, ST)

115-D. Fabrication and Properties of Low-Nitrogen Basic Bessemer Steels. (In French.) **Introduction.** P. Coheur. **I. Use of Limestone as a Flux.** P. Coheur. **II. Use of an Oxygen-Water Vapor Mixture.** J. Daubersy. **III. Mechanical-Test Results.** L. Marbais and M. Nepper. **IV. Statistical Study of the Influence of Composition on the Mechanical Properties of Thin Sheets.** M. Nepper and L. Dor. *Revue Universelle des Mines, de la Métallurgie des Travaux Publics, des Sciences et des Arts appliqués a l'Industrie*, ser. 9, v. 6, Dec. 1950, p. 401-430.

Results of experimental study. Apparatus and data. 34 ref. (D3, Q general, CN)

116-D. Influence of Additions of Calcium Oxide on Behavior of Manganese and Silicon During Acid Steelmaking. (In Russian.) I. A. Popov and B. V. Stark. *Izvestiya Akademii Nauk SSSR)* (Bulletin of the Academy of Sciences of the USSR), Section of Technical Sciences, Dec. 1950, p. 1806-1814.

Influence of CaO additions was studied experimentally. Dependence of equilibrium constants of the Mn and Si reactions on temperature was determined. Influence of CaO in acid slag is proportionately much less at a content of less than 7.8% than at higher concentrations. Correction factors were determined for calculation of equilibrium constants taking into consideration the influence of CaO additions. (D2, ST)

117-D. Evaluation of the Quality of Blast-Furnace Coke. (In Polish.) Franciszek Byrtus. *Hutnik*, v. 17, July-Aug. 1950, p. 183-189.

Reviews existing methods. Theoretical bases of each method are analyzed. Technique of testing, including evaluation of data. (D1, B18, Fe)

118-D. Continuous Casting of Steel at Babcock & Wilcox Tube Co. Isaac Harter, Jr. *Journal of Metals*, v. 3, Mar. 1951, p. 223-226.

See abstract of "Babcock & Wilcox Tube Company Develops Continuous Casting," *Iron and Steel Engineer;* item 3-D, 1951. (D9, ST)

119-D. Some Observations on the Continuous Casting of Steel. *Journal of Metals*, v. 3, Mar. 1951, p. 227-228. (From talk by Irving Rossi.)

Methods and apparatus developed by Continuous Metalcast Corp., New York, which are in regular production in many of the nonferrous industries and in the continuous casting of steel at the Watervliet plant of Allegheny Ludlum Steel Corp. (D9, ST, EG-a)

120-D. Atmospheric Pollution. Louis C. McCabe. *Industrial and Engineering Chemistry*, v. 43, Mar. 1951, p. 89A-90A, 92A.

Data on the first electrical precipitator installed on an openhearth furnace. It is operating at 97.9% efficiency, and is located at Columbia Steel Co.'s Torrance, Calif., works. (D2, A7, ST)

121-D. Carbon Disintegration Test for Blast-Furnace Brick. L. J. Trostel. *Journal of the American Ceramic Society*, v. 34, Mar. 1, 1951, p. 76-81; disc. p. 81-82.

Apparatus and procedure using CO for testing the resistance of blast-furnace brick. The apparatus is simple to operate, automatic, and can handle 60 specimens at a time. (D1)

122-D. Radioactive Indicators for Blast-Furnace Refractory Wear. E. W. Voice. *Journal of the Iron and Steel Institute*, v. 167, Feb. 1951, p. 157-161.

Techniques using cobalt-60. Appendix III, by T. E. Dancy, gives data on evaporation of Co at 1550° C., which are required to indicate the stability of the cobalt-60 pellets during long-term experiments. (D1, S19, Fe, Co)

123-D. (Book) Productivity in the Blast Furnace and Open Hearth Segments of the Steel Industry, 1920-1946. William T. Hogan. 150 pages. Fordham University Press, 22 Park Place, New York 7, N. Y. $4.00.

Changes in productivity in blast furnace and openhearth operation, physical volume, cost of production, and methods of operation. Advantages and disadvantages of new methods, success in new inventions, and adaptations of these are analyzed in detail. (D1, D2, A4, ST)

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World Metallurgical Congress
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E

FOUNDRY

152-E. Check Your Design and Save Metal. *Die Castings*, v. 9, Feb. 1951, p. 20-22.

Die-casting design principles. (E13)

153-E. Drying of Foundry Moulds and Cores. G. T. Hampton and W. H. Taylor. *Engineering*, v. 171, Feb. 2, 1951, p. 125; Feb. 9, 1951, p. 174. (A condensation).

Various types of equipment, its fuel consumption, and operating characteristics. (E19, E21)

154-E. Colloidal Graphite Lubricates Diecasting Machines. W. E. Lang. *Iron Age*, v. 167, Feb. 22, 1951, p. 83-84.

Advantages over conventional lubricants, especially when casting Al or Zn. (E13, Al, Zn)

155-E. Better Magnesium Melting Method Cuts Die Casting Rejects to .5%. Gerald C. Robechaud. *Western Metals*, v. 9, Feb. 1951, p. 26-27.

Procedures and equipment of McCulloch Motors Corp., Los Angeles. (E13, Mg)

156-E. An Improved Casting Process with Resin-Sand Moulds. H. W. Perry. *Aircraft Engineering*, v. 22, Dec. 1950, p. 371, 374.

Details of a new method developed by Bakelite Corp. from the Johannes Croning system. (E18)

157-E. Big Magnesium Foundry: New Alloy Castings for Air Force Results in Major Expansion. F. L. Church. *Modern Metals*, v. 7, Feb. 1951, p. 31-34.

Facilities and problems of Howard Foundry Co., Chicago. (E general, Mg)

158-E. Induction Furnaces Cut Foundry Melting Costs. Vernon Swan. *Modern Metals*, v. 7, Feb. 1951, p. 38-40.

Analysis of one of the biggest permanent-mold foundries, National Pressure Cooker Co., Eau Claire, Wis. Case in favor of induction melting of Al alloys. (E10, E12, Al)

159-E. Foundry Innovations Produce Big Savings. A. S. Hall. *Iron Age*, v. 167, Mar. 1, 1951, p. 110-113.

Simple expedients which help reduce labor costs and waste at the Buick gray-iron foundry. Novelties in cleaning practice cut time besides making castings better adapted to machining and service requirements. Manual handling is kept at a minimum. (E general, L12, CI)

160-E. The Fields of Utility of Investment Castings. R. L. Wood and D. von Ludwig. *Industrial Gas*, v. 29, Feb. 1951, p. 10-13, 20-25.

The many types of problems which are being handled by the investment process. Separated into four groups, they afford a logical way to consider the broad aspects of investment casting application. (E15)

161-E. The Fields of Utility of Investment Castings. R. L. Wood and D. Von Ludwig. *Mechanical Engineering*, v. 73, Mar. 1951, p. 191-197.

See item 160-E above. (E15)

162-E. Silicones Can Mean More Production, Less Maintenance. *Steel*, v. 128, Mar. 5, 1951, p. 87-90.

Properties and miscellaneous applications of silicones as lubricants, mold-release agents in die casting, insulating resins, and high-temperature-coating ingredients. 11 ref. (E13, Q9, L26)

163-E. Casting Steel Crankshafts. Edwin Bremer. *Foundry*, v. 79, Mar. 1951, p. 84-87, 245.

Equipment and procedures of Auto Specialties Mfg. Co., Benton Harbor, Mich. (E11, CI)

164-E. Efficient Operation Doubles Foundry Production. Robert H. Herrmann. *Foundry*, v. 79, Mar. 1951, p. 90-95, 240-242.

Equipment and procedures of Massey-Harris Co., Ltd., Brantford, Ont. Gray-iron farm-implement castings are made. (E11, T3, CI)

165-E. Selection and Use of Anthracite for Cupola Fuel. C. C. Wright. *Foundry*, v. 79, Mar. 1951, p. 96-97, 210-211.

Recommendations to foundries contemplating the substitution of anthracite for varying quantities of their usual cupola fuel. (E10, B18)

166-E. Instruments Keep Accurate Records. Maurice F. Degley. *Foundry*, v. 79, Mar. 1951, p. 108-111.

Use of recording instruments in the foundry. (E general, S16, S18)

167-E. Spanish Foundries. F. R. Morral. *Foundry*, v. 79, Mar. 1951, p. 138, 141.

(E general)

168-E. Electronic Core Baking. Boyd Hopkins. *Foundry*, v. 79, Mar. 1951, p. 154, 212.

Equipment and procedures at United Foundries Co., Wyoming, Pa. Several advantages. (E21)

169-E. Feeders for Castings; Foundry Sands—Composition, Particle Size. Pat Dwyer. *Foundry*, v. 79, Mar. 1951, p. 157, 160.

Practical recommendations. (E18)

170-E. Casting Tools for Molding Nonmetallic Materials. Thomas A. Dickinson. *Foundry*, v. 79, Mar. 1951, p. 190-192.

Fabrication procedures for cast-metal molds for nonmetallics. Although cast alloys lack some of the desirable characteristics of wrought products, the low cost of cast-metal tooling is an important factor. Patterns, molding methods, and alloys for different purposes. (E11, T6)

171-E. How to Use the Cupola. Bernard P. Mulcahy. *Foundry*, v. 79, Mar. 1951, p. 202, 204.

Concludes discussion of tap hole and cupola bottom. Types of charging equipment and metal handling. (To be continued.) (E10)

172-E. Induction Type Aluminum Melting Furnace. Manuel Tama. *Steel Equipment & Maintenance News*, v. 4, Feb. 1951, p. 6-7.

1000-kw. unit developed by Ajax Engineering Corp. (E10, Al)

173-E. The Croning Process for Moulds and Cores. H. N. Acker. *Canadian Metals*, v. 14, Feb. 1951, p. 30-31, 46.

New mold-making method which uses a thermosetting resin-sand mixture for low-cost, dust-free production. (E18)

174-E. Experimental Work on Oil-Sand Practice. D. T. Kershaw. *Foundry Trade Journal*, v. 90, Feb. 1, 1951, p. 115-122.

Tests made to determine the basic properties of core binders used in the foundry, and to help in the production of castings free from the type of defect usually associated with faulty oil sand. Work was done in a gray-iron foundry, but the results are applicable also to nonferrous materials. (E18)

175-E. Producing Ductile Cast Iron; Some Foundry Experiences. N. Croft. *Iron and Steel*, v. 24, Feb. 1951, p. 45-50.

Some of the ductile cast iron products currently being made. Development work and some of the problems encountered. Structure control and mechanical-test behavior. (E25, CI)

176-E. Foundry Melting Furnaces: Factors Governing Their Choice and Layout. F. C. Evans. *Metal Industry*, v. 78, Feb. 9, 1951, p. 103-105; Feb. 16, 1951, p. 123-125.

(E10)

177-E. Permeability of Sands. (In French.) Jacques Happich. *Fonderie*, Dec. 1950, p. 2302-2303.

The main factors influencing permeability, in particular grain size of the sand and moisture content. Data indicating relationship of these factors. (E18)

178-E. Some Effects of Melting Conditions on Defects of Cast Iron. I. (In Japanese.) Nobutaro Kayama. *Journal of the Casting Institute of Japan*, v. 22, No. 11, 1950, p. 1-7.

Effects of blast volume and melting temperature on shrinkage cavities in cupola melting. English abstract summarizes results. (E25, CI)

179-E. Study of the Surface of Castings. VII. (In Japanese.) Kazuo Katori. *Journal of the Casting Institute of Japan*, v. 22, No. 11, 1950, p. 7-13.

The relationship between mold surface, casting surface, and voids due to sand particles. The relationship between moldability, mold surface, and casting surface. Results are summarized in the English abstract. (E25)

180-E. Methods of Gating Sand Molds. Pat Dwyer. *Foundry*, v. 79, Feb. 1951, p. 180, 182.

Second of 3 articles. (To be concluded.) (E22)

181-E. Metal Penetration Test. S. L. Gertsman and A. E. Murton. *American Foundryman*, v. 19, Mar. 1951, p. 32-33.

Procedure for metal penetration in sand cores. (E25)

182-E. Manufacture of Bronze Boiler Drop Plugs. B. F. Kline and J. R. Davidson. *American Foundryman*, v. 19, Mar. 1951, p. 34-37.

Design and manufacture of plugs for steam-locomotive boilers by Southern Pacific Railroad Co. Composition is 86-88% Cu, 6-7% Sn, 1-2% Pb, 3-4% Zn, 1.0% max. Ni, 0.25% max. Fe, and 0.05% max. P. Tests on various other compositions are outlined. (E11, Cu)

183-E. Mechanizing the Smaller Foundry. *American Foundryman*, v. 19, Mar. 1951, p. 40-43.

(E general)

184-E. Core Practice as Related to Malleable Foundry Losses. E. J. Jory. *American Foundryman*, v. 19, Mar. 1951, p. 44-47.

Ways in which losses may be reduced by changes in core practice, giving practical recommendations. (E21, CI)

185-E. Frozen Mercury Patterns Add Flexibility to Precision Casting. A. H. Allen. *Steel*, v. 128, Mar. 19, 1951, p. 66-69.

How intricate shapes are cast to close tolerances in wide variety of metals and alloys. Weights range up to 90 lb. (E15)

186-E. Bibliography of the Die Casting Process. Part I. Harold Bourassa. *Light Metal Age*, v. 9, Feb. 1951, p. 27-28.

Die casting of Al alloys. 142 ref. (To be continued.) (E13, Al)

187-E. Die Casting Die Design. Part IV. (Continued). H. K. Barton and James L. Erickson. *Tool & Die Journal*, v. 16, Mar. 1951, p. 72, 76, 84, 110.

Runner design, additional functions of the runner, and sprue-to-runner design for the horizontal cold-chamber machine. (To be continued.) (E13)

188-E. Die Castings Can Be Detailed for Easier Finishing. Hiram K. Barton. *Die Castings*, v. 9, Mar. 1951, p. 23-25, 64-67.

Design recommendations. (E13, L general)

189-E. The Aluminium Casting Alloy D.T.D. 424 (Now Known as LM-4). D. C. G. Lees and W. H. Glaisher. *Metallurgia*, v. 43, Feb. 1951, p. 73-80.

This alloy was used extensively during the war as a substitute for alloys made from virgin materials. It has proved to be an excellent one for general castings. Influence of melting procedure and additions on the properties of materials made from swarf, skimmings, and virgin metals, also effects of grain size, gas content, and heat treatment. (E25, Al)

190-E. Drying of Foundry Moulds and Cores. G. T. Hampton and W. H. Taylor. *Foundry Trade Journal*, v. 90, Feb. 15, 1951, p. 169-175.

Previously abstracted from condensed version in *Engineering*. See item 153-E, 1951. (E19, E21)

191-E. Modern Melting Practices. *Foundry Trade Journal*, v. 90, Feb. 15, 1951, p. 177-179.

Discussion of paper by F. C. Evans (Jan. 19, 1950 issue; item 63-E, 1950). (E10, Cu, Ni)

192-E. Pianoforte Frame Castings. *Foundry Trade Journal*, v. 90, Feb. 22, 1951, p. 199-204.

Production from gray iron by a British firm. (E11, CI)

193-E. Core-Blower Application and Operation. G. W. Fearfield. *Foundry Trade Journal*, v. 90, Feb. 22, 1951, p. 207-210; Mar. 1, 1951, p. 229-232; disc., p. 232-233.

A comprehensive treatise. (E21)

194-E. The Adherence of Sand on Steel Castings. P. R. Beeley and H. T. Protheroe. *Journal of the Iron and Steel Institute*, v. 167, Feb. 1951, p. 141-157.

Methods used for visual comparison of degree of roughness of steel castings, and for a numerical assessment of penetration. A relationship between metal penetration. and sand adherence was established. The temperature limit at which adherence occurs, in the case of the standard casting adopted, was determined for casting temperature, metal composition, and sand conditions. Conditions at the sand-metal interface and an explanation of mechanism of adherence. Effect of varying the bonding agent. Relative merits of various mold coatings. (E11, CI)

195-E. A Large Aluminium Alloy Casting. *Engineer*, v. 191, Mar. 2, 1951, p. 284-285.

Casting has an o.d. of 7 ft., 9 in., a height of 7 ft., and weight of 7000 lb. It was made for use in a rotary vacuum filter. The pattern and molding methods. (E11, Al)

196-E. Investment Castings—Their Design and Limitations. D. F. B. Tedds. *Engineers*, v. 191, Mar. 2, 1951, p. 292-294.

Design factors, design considerations, process limitations, and costs. (E15)

197-E. (Book) **Die Casting.** H. H. Doehler. 502 pages. McGraw Hill Book Co., Inc., 330 W. 42nd St., New York 18. $8.00.

Covers the field from the history of die casting to present-day die-casting practices. Early and modern die-casting machines; selection and handling of die steels, and shop practice in construction of dies. Die-casting design, cost estimation, and comparative cost as compared to other mass-production methods. The various die-casting alloys, and advantages and disadvantages of each. Machining, finishing, and inspection of die castings; organic, elctroplated and mechanical finishes. Safety precautions. (E13)

Don't Miss—
World Metallurgical Congress
National Metal Congress
National Metal Exposition
Detroit—Oct. 15 to 19, 1951

F

PRIMARY MECHANICAL WORKING

50-F. Rolling Mills; Current American Research, Design and Installations. A. I. Nussbaum. *Iron and Steel,* v. 23, Dec. 1950, p. 481-486; v. 24, Jan. 1951, p. 11-15; Feb. 1951, p. 55-58.

1948 Mond Nickel Fellow presents a general survey of findings of a year's stay in the U. S. (F23)

51-F. The Production of Bolts and Nuts. A. P. Newell. *Engineering,* v. 171, Feb. 2, 1951, p. 142-143. (A condensation).

Principal methods: machining, cold upsetting, and hot forging, and their relative merits. (F22, G17, T7, ST)

52-F. Integrally-Stiffened Skin Revolutionizes Aircraft Construction: Extruded Sections and Forming Methods. P. E. Sandorff and George W. Papen. *Iron Age,* v. 167, Feb. 22, 1951, p. 74-77.

Fourth of series. How skin with integral T-shaped stiffness can be extruded. It will find wide application where loads are high and there are few irregularities in contour. Physical properties are high. Forming of integrally stiffened parts produced by any of the methods can be done on standard sheet-metal equipment, using only slightly different techniques. (F24, G1, Al, Mg)

53-F. Modern Blooming Mill Practices. D. W. Lloyd. *Iron and Steel Engineer,* v. 28, Feb. 1951, p. 59-64; disc., p. 64-65.

Effects of openhearth deoxidation practice and pouring-pit practice in connection with the formation of surface and subsurface defects. Poor practices in soaking pits and reheat furnaces and the effect such practices have on the product. The rolling mill is responsible for defects of a mechanical nature, such as overfills, underfills, laps, scratches, shearing, etc., which necessitate conditioning in the semifinished product. (F23, F21, D2, D9, ST)

54-F. Roller Guides in Modern Merchant Mill Practice. C. S. Lambert. *Iron and Steel Engineer,* v. 28, Feb. 1951, p. 79-87; disc., p. 87-88.

Includes numerous diagrams. (F23)

55-F. Compression-Sized Tubing May Offer Machining Economies. *Steel,* v. 128, Feb. 26, 1951, p. 74-75, 80.

Production and advantages. Rocking dies with tapered grooves form the wall over a mandrel, causing metal to flow both longitudinally and circumferentially, thus improving surface finish and dimensional precision. Bimetal tubes can be processed from telescoped cylinders. (F26)

56-F. Sulphide Precoats Facilitate Metal Forming. John A. Henricks. *Steel,* v. 128, Feb. 26, 1951, p. 76.

A series of new chemical conversion coatings developed for use in extrusion and forming of metals, particularly ferrous metals. Devex Corp. has specialized in a mixed sulfide coating which has a low coefficient of friction, as well as versatile means of application. It can be formed by vapor-phase sulfurization in a controlled atmosphere during annealing, by thermal decomposition of a predipped coating, by the chemical conversion of oxide or scale, or by the usual immersion method in a hot aqueous solution. (F1)

57-F. Advances in Heavy Closed Die Forging; German Counter-Blow Hammer Equivalent to 100,000 Lb. Unit. E. O. Dixon. *Steel Processing,* v. 37, Feb. 1951, p. 63-68, 101.

Forging equipment and other new developments of the past decade. (F22)

58-F. Increasing Drop Forging Die Life. Part III. John Mueller. *Steel Processing,* v. 37, Feb. 1951, p. 79-81.

Relative production and die life with various materials. (F22, T5, SG-j)

59-F. Rolls and Rolling. Part XXIII. Angles. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 39, Feb. 1951, p. 214-222.

Detailed diagrams and discussion of roll-pass diagrams for a wide variety of angle designs. (To be continued.) (F23)

60-F. Notes on the Extrusion of Steel. *Machinery,* Lloyd (Overseas Edition), v. 23, Feb. 3, 1951, p. 71.

Brief survey. (F24, G5, ST)

61-F. An Analysis of Some Roll-Pass Designs for Round Sections. D. A. Winton. *Journal of the Iron and Steel Institute,* v. 167, Jan. 1951, p. 31-41.

Schedules of roll passes for reducing billets to round sections are analyzed and compared. The square-diamond and the oval-square sequences require fewer passes than other sequences to reduce a billet to any particular size of round. An approximate relationship exists between area per pass, number of passes preceding it, and billet area. (F23)

62-F. Tyre Rolling Mill; Installation of Grid Controlled Rectifier Equipment. *British Steelmaker,* v. 17, Feb. 1951, p. 79-81.

Includes electrical equipment. Steel tires for railroad cars are produced. (F23, CN)

63-F. Bolts and Nuts; Production by Cold Upsetting or Hot Forging. A. P. Newall. *Iron and Steel,* v. 24, Feb. 1951, p. 70-72.

Development of mass-production methods of bolt and nut manufacture. Physical and metallurgical characteristics required. Recent application of high-frequency heating in forging and heat treatment. (F22, J general, T7, CN)

64-F. New Methods for Control of Thickness in Rolling Strip Metal. W. C. F. Hessenberg and R. B. Sims. *Research,* v. 4, Feb. 1951, p. 92-93.

Recent tests with the BISRA experimental rolling mill show that the relation between the separating force and the smallest distance between the rolls is substantially linear. Resulting equations form the basis of two new methods for automatically maintaining constant thickness during strip rolling. (F23)

65-F. Quality Problems in Rolling of Rail. (In Polish.) Andrezej Wojcik. *Hutnik,* v. 17, May-June, 1950, p. 106-113.

Different operating variables and their influence on the product. Emphasizes influence of the rolling process on microstructure and on physical and mechanical properties. 30 ref. (F23, CN)

66-F. How Big Should Presses Get? Chester Ricker. *American Machinist,* v. 95, Mar. 5, 1951, p. 148-149.

Air Force pilot plant which studies economic possibilities of giant hydraulic forging and extrusion presses, some from Germany. The biggest existing one (33,000 tons) was appropriated by Russia, but presses up to 75,000 tons are under construction. (F22, F24)

67-F. Cold Rolling Strip. An Appraisal of Today's Theory and Practice. J. D. Keller. *Steel,* v. 128, Feb. 19, 1951, p. 76, 78, 80, 82, 85; Mar. 5, 1951, p. 92, 94, 96; Mar. 19, 1951, p. 80, 83, 86.

First installment: recent developments in tneory, also pressure curves. Second installment shows that error in calculation of force on the rolls resulting from assumed circular-arc contour is negligibly small. Third installment: Experimental studies indicate that coefficient of friction of the strip, while being reduced, will vary along the contact length of the strip on the rolls. (To be continued.) (F23)

68-F. Recent Developments in Large Closed-Die Forging. E. O. Dixon. *Machinery* (American), v. 57, Mar. 1951, p. 184-189.

See abstract of "Advances in Heavy Closed-Die Forging; German Counter-Blow Hammer Equivalent to 100,000-lb. Unit," *Steel Processing;* item 57-F, 1951. (F22)

69-F. Improved Dies for the Cutlery Industry. *Metal Treatment and Drop Forging,* v. 18, Feb. 1951, p. 71-74.

Preparation and use of die-blocks made from a proprietary steel which has substantially increased die life. Stages in the production of dessert and carving-knives up to the final trimming. (F22, SS)

70-F. Ringing in Wire-Drawing Dies. J. G. Wistreich. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 162-164.

"Ringing," which is a form of grooving of dies near the point of entry of the wire, is an undesirable phenomenon, the suppression of which might result in better die performance. Concludes from experiments that, generally, ringing is not caused by abrasive action of a contaminated lubricant, but is the result of the steep stress gradient at the beginning of the working surface of the die. For this reason ringing cannot be altogether suppressed, but it is possible greatly to reduce its severity by applying heavy back pull to the wire. (F28)

71-F. Hot Bloom and Slab Shears. J. A. Kilby. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 165-199.

Apparatus designed for the hot cutting of blooms and slabs more than 6 in. square and 18 in. wide x 2 in. thick, respectively. (F29, ST)

G

SECONDARY MECHANICAL WORKING

84-G. High-Speed Machining of Forgings. Charles H. Wick. *Machinery* (American), v. 57, Feb. 1951, p. 147-151.

Cutting speeds as high as 1130 surface ft. per min. are being used by Ford Motor Co. in turning forged gear blanks. 2 lb. of metal is removed from one part in 12 sec. (G17, AY)

85-G. Cost-Cutting Methods of Producing "Henry J" Car Bodies. H. R. Smith. *Machinery* (American), v. 57, Feb. 1951, p. 167-173.

A new method of body die making involving use of cast plastic, a sharp reduction in number of stampings required per car, and increased use of automatic welding machines. (G16, G3, K1, T21, CN)

86-G. Preparing Plate Edges for Production Welding. C. A. Heffernon. *Machinery* (American), v. 57, Feb. 1951, p. 182-186.

Arrangements of oxyacetylene-torch cutting nozzles for edge preparation of sheet steel. (G22, ST)

87-G. Microstructure of Metals. Michael Field, Norman Zlatin, and John F. Kahles. *American Machinist*, v. 95, Jan. 22, 1951, p. 315, 317, 319; Feb. 5, 1951, p. 165, 167, 169. (Reprinted from "United States Air Force Machinability Report—1950", published by Curtiss-Wright Corp.)

Points out that machinability of metals is definitely related to microstructure. Illustrated description of the various phases encountered in steel and their effects on machinability. (G17, M27)

88-G. The Production of Tinplate Caps for Circular Lever-Lid Containers. J. W. Langton. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 137-140, 146.

Clarified by diagrams. (G3, CN)

89-G. Discussion on Some Factors in the Design of Aluminium Assemblies With Particular Reference to Forming, Joining, and Finishing. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 147-151.

Covers paper of above title by J. C. Bailey, presented at Autumn Conference, 1950, of the Sheet and Strip Metal Users' Technical Assn.
(F general, G general, K general, L general, Al)

90-G. Cold-Forming Large Nuts at High Speed. J. B. Springer. *Machinery* (London), v. 78, Feb. 1, 1951, p. 186-188.

Equipment and procedures at Industrial Nut Corp., Sandusky, Ohio. (G2, T7, CN)

91-G. Semiautomatic Apparatus for Oxygen Cutting of "PL" Steel. (In Russian.) *Torfyanaya Promyshlennost* (Peat Industry), v. 27, Nov. 1950, p. 28-29.

A device having a cast Silumin body and capable of cutting steel of up to 100-mm. thick. Operating characteristics for various thicknesses are tabulated. (G22, ST)

92-G. Shop Tests Develop Efficient Machining. G. W. Halston. *American Machinist*, v. 95, Feb. 5, 1951, p. 121-124.

Test procedures and results obtained in the shop of De Laval Steam Turbine Co. on cast iron, cast steel, and bronze. Varying conditions from which the most economical combination of feed, speed, and depth of cut in relation to tool life can be found. (G17, CI, Cu)

93-G. Redesigned Freezer Door Uses Less Steel. J. V. Kielb. *Iron Age*, v. 167, Feb. 22, 1951, p. 67-70.

A unique home-freezer door design cuts materials costs by permitting use of lighter-gage steel, introduced knotty problems in drawing and porcelain enameling. How these were solved by refinements in design and processing methods.
(G4, L27, CN)

94-G. Lead-Bearing Steel Improves Machinability. Henry J. Holquist. *Materials & Methods*, v. 33, Feb. 1951, p. 142, 144, 146.

Improved properties of "Ledloy", which contains 0.25% Pb in finely dispersed form. Machinability data. (G17, AY)

95-G. Fundamentals of the Working of Metals. Part XX. George Sachs. *Modern Industrial Press*, v. 13, Feb. 1951, p. 6, 8, 38.

Contour forming and bending; stresses in contour forming; difficulties in contour forming; stretching limits; and wrinkling, distortions, and springback. (G4, G6)

96-G. Why Not Spin It? L. F. Spencer. *Iron Age*, v. 167, Mar. 1, 1951, p. 105-109.

Spinning is an ideal forming method for small production quantities, and is of value in larger production runs of parts which would require complex press tooling. Many materials can be spun, and the method is often used as an operation subsequent to deep drawing. Details of the process as applied to different materials, including recommendations for selection of lubricants. (G13)

97-G. High Machinability and Productivity of Ductile Iron. John F. Kahles, Norman Zlatin, and Richard B. Kropf. *Metal Progress*, v. 59, Feb. 1951, p. 238-242. (Based on "U. S. Air Force Machinability Report, 1950," published by Curtiss-Wright Corp.)

Machinability tests were made on four types of flake-graphite and five types of nodular-graphite cast iron. Effects of variations in annealing practice. Cutting speeds vs. metal removed are plotted for the different types. Photomicrographs illustrate structures. (G17, J23, CI)

98-G. 15,000,000 Stampings Per Grind on Carbide Dies. John E. Spofford, Jr. *Steel*, v. 128, Mar. 5, 1951, p. 80-82.

Progressive-die practice of Tinnerman Products, Inc., Cleveland, in which carbide inserts are used at all stations. Increased production, decreased equipment down-time, lower die maintenance costs, and better product quality control have been achieved by use of carbides. (G1, T5, C-n)

99-G. Aluminum Aircraft Parts Hot Formed Successfully. Gilbert C. Close. *Steel*, v. 128, Mar. 5, 1951, p. 84-86.

How Northrop Aviation uses production-line hot forming techniques to fabricate 75S Al alloy airframe components in a fraction of the time formerly required. Oil-bath immersion and electrical resistance are the two heating methods employed. (G1, Al)

100-G. Shot-Peening Springs. Part I. *Mainspring*, v. 13, Feb. 1951, p. 1-4.

New information obtained since 1945. Applicable to a wide variety of ferrous and nonferrous springs. (G23, T7)

101-G. Impact Stamping Comes of Age. Philip Brenton. *Steel Processing*, v. 37, Feb. 1951, p. 69-73.

Process which makes it possible to obtain stampings in small lots at a reasonable cost. Varied applications in the automotive and aircraft industries. (G3)

102-G. Band Machining Saves Metal. H. J. Chamberland. *Iron Age*, v. 167, Mar. 8, 1951, p. 97-99.

In many machining operations, considerable metal is wasted in chips which would be usable if removed as a solid slug. Preliminary metal removal by band machining cuts this waste. Special method of cutting blanking dies by band machining enables use of the cut-out slug as the punch, saving metal and reducing machining costs. (G17)

103-G. Wraparound Bench Forms Sheet Metal Faster. H. W. Eschedor. *Iron Age*, v. 167, Mar. 8, 1951, p. 100-102.

Machine made largely of angle iron which puts 4 right-angle bends in a roaster-body shell at a rate of 92 pieces an hr. Similar equipment forms the supporting cabinet's door and back panels. (G6)

104-G. The Application of Cutting Fluids to Machining Operations. R. B. Niebusch and E. H. Strieder. *Mechanical Engineering*, v. 73, Mar. 1951, p. 203-207.

Results emphasize the fact that cutting fluids often are not used so as to obtain maximum benefits. Only when a large volume of clean fluid bathes the tool (or wheel) and the actual cutting zone are these benefits obtained. This requirement can be met by making relatively simple, inexpensive modifications to existing cutting-fluid supply systems. Increases in tool life of as much as 100% may be obtained, together with other benefits such as improved surface finish, greater accuracy, and reduction or elimination of steam and smoke. (G21)

105-G. Machining Copper and Copper-Base Alloys. Bartlett West. *Modern Machine Shop*, v. 23, Mar. 1951, p. 100-106, 108, 110, 112, 114, 116, 118, 120, 122, 124, 126.

Presents tabular data on machining process. Cutting tool diagrams for the various types. (G17, Cu)

106-G. Raising the Limits of High Speed Steel Machining. W. R. Frazer. *Tool Engineer*, v. 26, Mar. 1951, p. 33-37.

Correlates recent work of various investigators. Effects of heat treatment and composition on cutting ability, grain size, and hardness of toolsteels. Recent developments in milling-cutter design where high rake angles—both radial and axial—are used. Performance data are tabulated. (G17, TS)

107-G. New Tool Removes Casting Defects Quickly. Robert H. Herrmann. *Foundry*, v. 79, Mar. 1951, p. 164, 166-167.

Patented oxygen-jet electric-arc torch known as the Arcit Jet torch is designed to speed cleaning-room operations in removing sand and slag inclusions; cracks; porosity; shrink cavities; gas pockets from chills, chaplets, core anchors, and other casting defects. (G22, E24)

108-G. Engineering Developments in Light Metals. Thomas Piper. *Light Metal Age*, v. 9, Feb. 1951, p. 8-14.

A number of fairly recent developments in machining, hot and cold forming, riveting, and welding of Al and Mg.
(G general, K general, Al, Mg)

109-G. Abrasive Operations in the Foundry. Boyd H. Work. *Canadian Metals*, v. 14, Feb. 1951, p. 23-28, 47-49.

Types of equipment used — machines and abrasives wheels; cost reduction factors. 7 ref.
(G18, E general)

110-G. Oxygen Profiling and Cutting. *Machinery Lloyd* (Overseas Edition), v. 23, Feb. 3, 1951, p. 74-79, 81, 83, 85, 87.

Fundamental theory and some typical examples of modern equipment. (G22)

111-G. Bending. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 23, Feb. 17, 1951, p. 89-92.

The nine bending processes, including spinning; hammering the metal to a formed tool; bending it around a pin or forming tool, between walls; bending it about a fixed pin without walls; folding it over itself or a fixed bar or plate; holding one end firmly in a pivoting vise and preventing the movement of the free end by a fixed stop; forming the metal around a rotating mandrel or forming tool; forcing it between fixed points or walls; and rolling. (G6)

112-G. Metal Abrasive Pellets. *Metal Industry*, v. 78, Feb. 9, 1951, p. 111-112.

Manufacture and uses for peening and shot blasting. (G23, L10)

113-G. Mechanized Production of Railway Laminated Springs. *Engineering*, v. 171, Feb. 9, 1951, p. 149-152.

Procedures and equipment of a British firm. They include press operations, heat treatment, and inspection. (G1, J general, T7, CN)

114-G. The Effect of Manganese Segregations on Machinability; An Application of Microradiography. K. J. B. Wolfe and I. R. Robinson. *Metallurgia*, v. 43, Jan. 1951, p. 3-7.

Machinability determinations using drill-life tests indicate that Mn segregations, because of their abrasive nature, increase drill wear and, because of their shape and brittleness, reduce the force required for the cutting operation. An estimate of the Mn content of the segregations is made and discussed in the light of the Fe-Mn equilibrium diagram and transformation curves.
(G17, M24, ST)

115-G. "We Turned SAE 1045 at 2150 SFPM." F. J. Fields. *American Machinist*, v. 95, Mar. 5, 1951, p. 102-103.

An inquiry from England asked if it is possible to apply very high speeds to turning operations to get production and economical tool life using commercial carbides. Some tests indicated that speeds of 1500 ft. per min. were not practical for carbide-tool turning of EN9 steel, since failure occurred in ¾ in. Mr. Fields, in reply, gives details of tests in which results indicated in the title were successfully obtained. Believes that even higher speeds can be obtained. (G17, CN)

116-G. Carbide Problems in Contract Tool and Die Shops. *American Machinist*, v. 95, Mar. 5, 1951, p. 172, 174, 176, 178, 180, 182, 184, 186, 188, 190-191, 193-194, 206, 208, 210, 212, 214, 216.

Official transcript of discussion at recent convention of National Tool and Die Manufacturer's Association which dealt with various carbide problems. (G17, G1, T5, C-n)

117-G. Steel Prop Blades Extruded With Internal Taper. E. J. Tangerman. *American Machinist*, v. 95, Mar. 5, 1951, p. 128B-128E.

Process announced jointly by Curtiss-Wright and the U. S. Air Force. The process slashes production time, eliminates welding, and improves product quality. Specially developed mandrels on a ram are apparently used to produce complex internal cross-sections, including long blade taper. Material is Cr-Ni-Mo steel. (G5, AY)

118-G. Getting the Most Out of Machines and Tools. *Steel*, v. 128, Mar. 12, 1951, p. 80-83, 106, 110, 113.

Third of six sections of a report published by Curtiss-Wright on a comprehensive cooperative machinability project sponsored by the U. S. Air Force. (G17)

119-G. Deep-Drawing Aluminum Parts With Low-Cost Dies. Emilio Andreola. *Machinery* (American), v. 57, Mar. 1951, p. 173-179.

Equipment and procedures at Sperry Gyroscope Co.'s plant at Lake Success, N. Y. (G4, Al)

120-G. Cold Extrusion of Steel; Effect of Lubricants, Tool Contours, and Reductions. Hubert Hauttmann and W. M. Baldwin, Jr. *Iron Age*, v. 167, Mar. 15, 1951, p. 99-104.

Summary of the latest information on the Neumeyer process shows that certain phosphate coatings are as good as the best electrolytic porous metallic coatings of zinc. Die apex angles from 40 to 180° were tested. Small die angles gave lowest extrusion pressures and best metal flow. Tool contours were studied in extruding 25 different steels. Transverse toughness of steels reduced 85% is much higher than expected. (G10, ST)

121-G. New Method Machines: Sintered Carbides, Sintered Borides, Hardened Tool Steels. Alvin S. Cohan. *Journal of Metals*, v. 3, Mar. 1951, p. 216-217.

Cavitron process which utilizes ultrasonic vibrations for cutting, threading, drilling, forming, and other machining operations on fully sintered cemented carbides and borides, stellites, hardened tool and die steels, and other hard and brittle materials such as glass, rubies, sapphires, and diamonds. (G17, C-n, TS)

122-G. How to Spin Metals. John W. Lengbridge. *American Machinist*, v. 95, Mar. 19, 1951, p. 145-155.

Special report tells how to estimate costs of spun vs. drawn products. Spinnability ratings for various metals and basic information on the design of spun products. The technique of spinning, the tools and equipment required, and the various production methods employed. (G13)

123-G. Edge Preparation of Plate for Welding. C. A. Heffernon. *Welding Journal*, v. 30, Mar. 1951, p. 221-228.

Flame shaping of steel-plate edges for production welding to assure uniformity of cut surfaces and correct alignment. (G22, K general, ST)

124-G. Flame Gouging for Better Welds in Autoclave Fabrication. *Welding Journal*, v. 30, Mar. 1951, p. 262. (G22, ST)

125-G. New Developments in Flame Cutting Stainless Steel. G. E. Bellew. *Welding Journal*, v. 30, Mar. 1951, p. 265-268.

The main problem is mechanical and chemical, namely removal of refractory oxides, by means of a suitable flux so as not to block the cutting oxygen. (G22, SS)

126-G. Die-Casting: Tooling-Up for Spinning Operations; Tooling-Up for Ironing, Swaging and Bending Operations. H. K. Barton. *Metal Industry*, v. 78, Feb. 16, 1951, p. 129-130, 132; Feb. 23, 1951, p. 152-153.

Operations on die-cast components applicable to ductile Zn-base alloys. (To be continued.) (G13, G4, G6, Zn)

127-G, (Book) Machinability and Machining of Metals. Norman E. Woldman and Robert C. Gibbons. 518 pages. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18. $7.50.

An up-to-date analysis of the metallurgical and machining characteristics of modern metals and alloys. Each group of metals is treated separately. Includes sections on low-carbon and high-carbon steels, tool and die steels, cast irons, aluminum, magnesium, copper, nickel, and zinc-base alloys. (G17)

H
POWDER METALLURGY

12-H. Powder Metallurgy Can Help Conserve Critical Metals. A. J. Langhammer. *Materials & Methods*, v. 33, Feb. 1951, p. 134, 136, 138, 140.

Applications which promote conservation. (H general)

13-H. Porous Metals in Engineering. H. W. Greenwood. *Machinery Lloyd* (Overseas Edition), v. 23, Feb. 17, 1951, p. 83, 85-87.

The infiltration or impregnation of a sintered-metal skeleton to obtain a nonporous compact or part points out resultant advantages in increased tensile strength, accuracy, high refractoriness, resistance to creep, and the lowest possible density. (H16)

14-H. Metal Ceramics or Powder Metallurgy. (In French.) M. Oswald. "Les hautes Températures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 1206-1217.

A short review on the basis of the literature. Emphasizes method of production, properties of finished products, and fields of application. 23 ref. (H general)

15-H. Hot Pressing Produces High-Strength Carbides. (Continued). John L. Ellis. *Tool & Die Journal*, v. 16, Mar. 1951, p. 64, 68, 122-124.

Achievement of higher dimensional accuracies, application to large-sized dies, hot-pressing special shapes, manufacturing advantages, die finishing operations, design limitations, heating methods, pressure ranges, and the time element. (H14, C-n)

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First World Metallurgical Congress
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J
HEAT TREATMENT

66-J. Flame-Hardening as a Versatile Production Tool. Gordon H. Silver. *Machinery* (American), v. 57, Feb. 1951, p. 187-189.

Flame-hardening of lathe-bed ways is a typical application. (J2, CN)

67-J. "Decarb" on Screw Products Yields to Controlled Atmosphere. John E. Tschopp. *American Machinist*, v. 95, Feb. 19, 1951, p. 142-143.

Methods and equipment used by Chicago Screw Co., Bellwood, Ill., to produce capscrews and bolts completely free of decarburization. The products are carried on a belt through a controlled-atmosphere furnace which restores the required carbon. They then pass through a water-quench tank. (J2, ST)

68-J. Economical Methods for Production Hardening. *Metal Treating*, v. 1, Nov. 1950, p. 6-9; v. 2, Jan.-Feb. 1951, p. 8-12.

A condensation of a recorded panel discussion held during an American Society for Metals meeting. (J26)

69-J. Which Process for Case-Hardening Steel—Carburizing, Nitriding or Carbonitriding? Kenneth Rose. *Materials and Methods*, v. 33, Feb. 1951, p. 62-64.

Relative merits and applicabilities. (J28, ST)

70-J. Ford Transmission Shafts Gas Carburized in Automatic Furnaces. *Industrial Heating*, v. 18, Feb. 1951, p. 216-220, 222, 224, 226, 228.

Equipment is diagrammed and illustrated. (J28, ST)

71-J. Electric Annealing Furnace Assures Uniform Grain Size of Seamless Copper Tubing. *Industrial Heating*, v. 18, Feb. 1951, p. 230, 232, 234.

Furnace in use by Viking Copper Tube Co., Cleveland. (J23, Cu)

72-J. Carbonitriding and Related Heat Treating Processes. M. Neumeyer. *Industrial Heating*, v. 18, Feb. 1951, p. 236, 238, 240, 242, 244.

Carbonitriding, gas carburizing, and clean hardening methods of heat treating steel. Furnace atmospheres, including gas generators and constituents used. (J28, J2, ST)

73-J. Bright Hardening, Carburizing and Carbonitriding. Harold Ipsen and R. Krogh. *Metal Progress*, v. 59, Feb. 1951, p. 232-238.

Theory and practice, equipment, applications and costs. (J28, ST)

74-J. Heat Treatment in Wartime Germany. *Metal Progress*, v. 59, Feb. 1951, p. 266, 268, 270, 272-273. (Condensed from "The Ferrous Metal Industry in Germany During the Period 1939-1945," George Patchin and Ernest Brewin, BIOS, Over-All Report 15.) (J general, ST)

75-J. Carbonitriding Gains Wider Acceptance. E. J. Pavesic and A. E. Uitti. *Iron Age*, v. 167, Mar. 1, 1951, p. 101-104.

Carbonitriding as a means of case hardening results in big savings on large production runs. An endothermic career of gas is used in a compact furnace which combines low operating cost and high production with a minimum of handling. (J28, ST)

76-J. Austempering of Proving Rings With Minimum Distortion. Fred Heinzelman. *Metal Treating*, v. 2, Jan.-Feb. 1951, p. 4-5.

Procedure developed for proving rings of SAE 52100 steel. (J26, AY)

77-J. What's New in Heat Treating. Howard E. Boyer. *Steel Processing*, v. 37, Jan. 1951, p. 33-37, 42; Feb. 1951, p. 83-86.
(J general)

78-J. Homogenization of Cast Steels. Mehmet T. Aktutay and Philip C. Rosenthal. *Foundry*, v. 79, Mar. 1951, p. 100-105, 242-244.

Investigations indicate that for heavy-section steel castings, particularly higher-carbon material, the increased hardenability and better yield-tensile ratios obtained by homogenization heat treatment may warrant use of this process. Photomicrographs illustrate microstructures obtained. (J21, CI)

79-J. Annealing of Monel, Nickel and Inconel. II. Auxiliary Factors in Annealing. *Wire Industry*, v. 18, Feb. 1951, p. 133-134, 137.

Pyrometry and temperature control; protective atmospheres; purging; effect of cold work previous to annealing; effect of rate of cooling; grain-size control and its effect upon fabrication; and protection from contamination. (J23, Ni)

80-J. A Surface Effect on Extruded Lead and Its Alloys. R. C. Gifkins and H. C. Coe. *Metallurgia*, v. 43, Jan. 1951, p. 47-48.

In attempting to produce fully annealed specimens of Pb and Pb alloys for creep-test purposes, using the quality of X-ray back-reflection patterns as an annealing criterion, it was found that extruded samples do not appear to be fully annealed by the treatment used satisfactorily with rolled samples. The effect appears to be due to a very shallow surface layer which can be removed by a suitable etching technique. (J23, Q3, Pb)

81-J. Production Problems. I. Dimensional Changes in Gears and Pinions. *Iron and Steel*, v. 24, Feb. 1951, p. 51-54.

Changes in dimensions in machined components are frequently encountered after production heat treatment (case hardening). Example is increase in pitch diameter of up to 0.004 in. on gears and pinions. Heat treatment recommendations. 19 photomicrographs of 50-1000 magnification illustrate results. (J26, ST)

82-J. Carburization Using Sawdust. (In Russian.) A. Kochin. *Stanki i Instrument* (Machine Tools and Equipment), v. 21, Nov. 1950, p. 36-37.

Optimum conditions as determined by one plant which has used the sawdust of deciduous trees as its exclusive carburization medium for two years. Treatment of the sawdust before use and details of the carburization process. (J28)

83-J. Investigation of Quenching Diagrams by Means of the Braun Tube. (In German.) Yasumasa Isihara. *Technology Reports of the Tohoku University*, v. 14, no. 1, 1949, p. 77-88.

Details of electrical apparatus. Effects of carbon content and bar dimensions on the cooling curves of steel. (J26, ST)

84-J. Copper Tubes Spot Annealed in Deoxidizing Atmosphere. W. W. Swarthout. *Steel*, v. 128, Mar. 12, 1951, p. 84.

Procedure and equipment. The tubes are used for Freon condensers of refrigeration and air-conditioning equipment. (J23, Cu)

85-J. Good Carburizing Practice. VII. How to Select Case Depth and Refine the Case. VIII. Many Factors Produce Distortion. IX. Selective Carburizing Depends on Medium. X. Chemistry Vitally Affects Case Properties. T. A. Frischman. *American Machinist*, v. 95, Feb. 5, 1951, p. 128-131; Feb. 19, 1951, p. 138-141; Mar. 5, 1951, p. 106-109; Mar. 19, 1951, p. 138-141.
(To be continued.) (J28, ST)

86-J. Commercial Flame Hardening. Elmer J. Cox. *Welding Journal*, v. 30, Mar. 1951, p. 229-233.

Equipment and procedures of Pittsburgh Commercial Heat Treating Co. Generally applicable recommendations for flame hardening of steel by commercial heat treaters. (J2, ST)

87-J. The Manufacture of Harrow and Plough Discs. *Coke and Gas*, v. 13, Feb. 1951, p. 66-67.

Multiple-burner furnaceless heat treatment unit. (J general, T3, CN)

88-J. The Surface Hardening of Steel. Part II. Mechanism of the Carburizing Process and the Effect of Alloying Elements and Heat-Treatment. G. T. Colegate. *Metal Treatment and Drop Forging*, v. 18, Feb. 1951, p. 63-70.

Mechanism of the carburizing process, and effect of alloying elements on properties and rate and depth of carburization. The different heat treatments followed before and after carburizing and their effect are also examined. (To be continued.) (J28, ST)

89-J. The Effect of Isothermal Treatment on the Mechanical Properties of Steel; With a Note on Solder Embrittlement. M. Douglas Jepson. *Metallurgia*, v. 43, Feb. 1951, p. 62-64, 81-82.

Compares isothermally transformed material (tempered in some cases) and quenched and tempered specimens. Results show the isothermal treatment to have an advantage, but the marked inferiority exhibited by the quenched samples tempered at temperatures below 300° C. was found to be due to embrittlement by the molten solder of the tempering bath.
(J26, Q general, ST)

K

JOINING

139-K. Engineering Aspects of Tool and Die Welding. Part III. Arthur R. Butler. *Tool Engineer*, v. 26, Feb. 1951, p. 40-42.

Recommended procedures for repairing toolsteel units by arc welding. (K1, T6, TS)

140-K. Solders and Brazing Materials. *Materials & Methods*, v. 33, Jan. 1951, p. 97, 99; Feb. 1951, p. 97, 99. (Adapted from data to appear in "Materials Technology for Electron Tubes", by W. H. Kohl, to be published by Reinhold Publishing Corp.)

Tables include names of materials and suppliers, compositions, applicable fluxes, melting and flow points, and remarks. (K7, K8, T5)

141-K. Silver Brazing Eases Shotgun Wedding. Kenneth Ireland. *American Machinist*, v. 95, Feb. 19, 1951, p. 164-165.

Use of silver brazing in manufacture of shotguns. One model has five subassemblies comprising six Ag alloy brazed joints. An alloy of Ag-Cu-Cd-Zn with a flow point of 1145° is used for all of these joints. (K8, AY, Ag)

142-K. Some Pointers on Soldering Monel. *Sheet Metal Worker*, v. 42, Feb. 1951, p. 30-31.
(K7, Ni)

143-K. "Redux" Adhesive Process for Metals. F. H. Parker. *Engineering*, v. 171, Feb. 2, 1951, p. 144-146. (Excerpt from lecture.)

Commercial application of Redux process for joining Al alloys.
(K12, Al)

144-K. Welding Fixtures for Magnesium Aircraft Components. G. C. Close. *Machinery* (London), v. 78, Feb. 1951, p. 193-197.
(K1, Mg)

145-K. Production of Trailer-Body Components by Resistance Welding. A. I. Nussbaum. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 167-173, 182.

Use of the "Shotweld" process at Budd Co., Philadelphia. Material is stainless steel. (K3, T21, SS)

146-K. Some Aspects of Continental Welding Practice as Reported by Members of the Recent Tour Organized by S.A.S.M.U.T.A. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 175-178.
(K general)

147-K. Great Increase in Spot-Welding Speeds Made Possible by the Use of New Equipment. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 179-182.

Use of multi-point machines in Britain. (K3)

148-K. Magnesium Assembly Methods. *Magazine of Magnesium*, Feb. 1951, p. 8-11.

Welding, riveting, brazing, cementing, bolts, screws, etc., for joining Mg sheet. (K general, Mg)

149-K. New Copper Paste Permits Brazing Economies. Kenneth Rose. *Materials & Methods*, v. 33, Feb. 1951, p. 79-80.

Hand labor and waste are largely eliminated by using Cu brazing paste for joining steel parts instead of pre-placed forms. (K8, ST, Cu)

150-K. Ultrasonic Soldering Irons. B. E. Noltingk and E. A. Neppiras. *Journal of Scientific Instruments*, v. 28, Feb. 1951, p. 50-52.

Two instruments developed to facilitate the tinning of Al and other light-metal surfaces. One is designed to be used in the conventional manner and is suitable for soldering thin sheet; in the other, the vibrations are communicated to a solder bath in which small pieces of metal and also foil and wires can be tinned by dipping. (K7, Al)

151-K. The Removal of Enamel From Copper Wire. T. P. Gill and M. L. Hume. *Journal of Scientific Instruments*, v. 28, Feb. 1951, p. 60-61.

Problem is important when enameled Cu wire is to be soldered. The enamel can be effectively stripped by immersing for a short period in chloracetyl chloride at room temperature. (K7, L12)

152-K. Welding Replaces Soldering and Increases Production. Herbert Chase. *Iron Age*, v. 167, Mar. 1, 1951, p. 114-117.

Engineers of Delco-Remy Div., General Motors Corp., have concluded that welded joints, or those termed "braze-welds," are preferable to most other types, including those made by soldering and tubular riveting, except where the joints may have to be broken for service work. Conclusions apply particularly to starting, lighting, ignition, and related equipment involving a variety of metals and alloys. Several interesting setups. (K8)

153-K. Report of Special Committee on Continuous Welded Rail. H. B. Christianson. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 589-594.

Mainly a bibliography arranged by year of publication.
(K general, T23, CN)

154-K. Report on Assignment 4. Rail End Batter. Causes and Remedies. R. P. Winton, chairman. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 629-633.

Part of Report of Committee 4 on Rail. Tests on various methods of building up rail ends by welding on the Richmond, Fredericksburg and Potomac Railroad near Penola, Va., in May 1941.
(K general, S21, T23, CN)

155-K. Some Maintenance Jobs You Can Do With Cold Pressure Welding. *Power Engineering,* v. 55, Feb. 1951, p. 95-96.
(K5)

156-K. Shielded Arc Welding. James Blane. *Western Machinery and Steel World,* Feb. 1951, p. 81-83.
Argon metal-arc welding equipment, procedures, and applications. (K1)

157-K. Heliarc Welding Finds Its Stride. Gilbert C. Close. *Modern Machine Shop,* v. 23, Mar. 1951, p. 84-90, 92, 94.
Developed some 10 years ago for welding Mg, the Heliarc process is being successfully used today in the welding of alloy steels, Ni, Al, and Cu. Typical applications. (K1)

158-K. Engineering Aspects of Tool and Die Welding. Part IV. Arthur R. Butler. *Tool Engineer,* v. 26, Mar. 1951, p. 60-62.
Fabrication of die units from common SAE steels with hard facing applied to cutting edges and working areas. Selection of rods for metallic-arc welding repair. Atomic-hydrogen arc welding as applied to tools and dies. (K1, L24, TS)

159-K. Elements of Resistance Welding. A. E. Rylander. *Tool Engineer,* v. 26, March 1951, p. 67-74.
Special report. (K3)

160-K. British Metals Adhesive Uses. C. J. Moss. *Aviation Week,* v. 54, Mar. 5, 1951, p. 30, 32-35, 37.
British "Redux" process and its uses. (K12)

161-K. Stubbing Drill Collars by Thermit Welding. Roy F. Carlson. *Oil and Gas Journal,* v. 49, Mar. 8, 1951, p. 70-71, 84.
Process borrowed from the railroad and heavy-machinery industries used to prolong the useful life of drill collars. (K4, ST)

162-K. Welding Light Metals With Inert Gas Shielded Arc. Part II. W. Wade Moss, Jr. *Light Metal Age,* v. 9, Feb. 1951, p. 16-18.
Recommendations applicable to Al, Mg, and Ti. (K1, Al, Mg, Ti)

163-K. Alcoa Reports—Fabrication & Application Advancements During 1950. Wm. McCague. *Light Metal Age,* v. 9, Feb. 1951, p. 19-25.
Pressure welding, rolling of tapered sheet, and a wide variety of new applications of Al and its alloys. (K2, G11, T general, Al)

164-K. Every Welding Shop Needs Tempilstiks. Hugo W. Hiemke. *Victor Weld,* Jan.-Feb. 1951, p. 4-6.
Use of above temperature-indicating crayons for accurate control of preheating temperatures. Includes "metal-preheating chart." (K general, S16)

165-K. The Silver Brazed Pipe Line. John B. Ross. *Canadian Metals,* v. 14, Feb. 1951, p. 41, 43.
Procedure, advantages, and applications of the product. (K8)

166-K. Welding; The Modern Application of the Metallic Arc Process. *Automobile Engineer,* v. 41, Feb. 1951, p. 75-76. (From paper by G. Cubitt-Smith.)
Concerned largely with steel. Automatic processes; metallurgical considerations; induced stresses; and effect of alloying elements. (K1, ST)

167-K. The Welding of Aluminium Alloys, Particularly for Structural Applications. W. K. B. Marshall. *Transactions of the Institute of Welding,* v. 13, Dec. 1950, p. 178-185.
Properties of the alloys and the basic metallurgy of the welded joints. Advantages and disadvantages of the various welding processes applicable to the above and some comments on the influence of welding on design of Al-alloy structures. 12 ref. (K general, T26, Al)

168-K. Squeeze-Riveting; Equipment for Flush-Riveted Fuselage-Skin Panels for the Bristol Type 175 Aircraft. *Aircraft Production,* v. 13, Feb. 1951, p. 41-48.
(K13, Al)

169-K. Metal-Stitching: A Review of the Possibilities of the Process; Strength-Characteristics and Applications. C. A. H. Pollitt. *Aircraft Production,* v. 13, Feb. 1951, p. 62-64.
Joining of leather or asbestos to Al, rubber to stainless steel, and textile fabrics to Al are typical examples. (K13)

170-K. Aspects of Fabrication in the Manufacture of Electrical Power Plant. H. H. Reeve. *Welding and Metal Fabrication,* v. 19, Feb. 1951, p. 44-49.
Welding equipment and procedures at a British plant. Consists entirely of large steel members. (K general, T25, CN)

171-K. Sea-Going Motor Launches Built Near London. J. V. Thomas. *Welding and Metal Fabrication,* v. 19, Feb. 1951, p. 68-70.
Welded construction utilizing mild steel. (K general, T22, CN)

172-K. The Welding of Pressure Vessels. H. Harris. *Welding and Metal Fabrication,* v. 19, Feb. 1951, p. 70-73.
Forming, welding and inspection practice. Supersonic examination. (K general, S13, T26, ST)

173-K. Physical Aspects of Weldability of Glass to Metal in the Electron-Tube Industry. III. Influence of Shape Variation and Certain External Variables on Stresses Developed in the Welds; Applications and Conclusions. (In French.) Georges Trébuchon and Jacques Kieffer. *Verres et Réfractaires,* v. 4, Dec. 1950, p. 356-366.
Effects of shape, also of factors such as humidity, thermal shock, annealing atmosphere, electrical phenomena, etc. Methods for minimizing such effects. Fields of application of the results. 22 ref. (K11)

174-K. The Atomic-Hydrogen Torch. (In French.) Louis Hackspill and Jean Cueilleron. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 198-224.
Comprehensive review of literature on principles; equipment; physical and chemical properties of atomic hydrogen; and applications, which include welding, production of metallic Mg by hydrogen reduction, and various industrial chemical processes. 468 ref. (K1, C2, Mg)

175-K. The Hydrogen-Fluorine Torch. (In French.) J. Cueilleron. "Les hautes Temperatures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 1303-1304.
Temperatures in the neighborhood of 4000° C. are obtained. Application to welding and cutting of various metals. (K2, G22)

176-K. Progress in the Development of Automatic Welding Under Flux in the Past 2-3 Years. (In Russian.) E. O. Paton. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 3-8.
Research and developments of recent years in increasing the quality of welded structures from low-carbon steel; improving the technique of automatic welding of carbon, low-alloy, and alloy steels; developing more effective methods of automatic and coated-electrode-wire welding under flux; and improving automatic welding apparatus. (K1, CN, AY)

177-K. High-Production Methods of Welding Developed by "TsNIITMASh MTM". (In Russian.) K. A. Udotov. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 8-14.
Progress of the welding section of the Central Heavy-Machinery Institute of the U.S.S.R. with respect to new processes, equipment for automatic welding under flux, electrodes for welding low-carbon steels, electrodes for welding steels with special properties, equipment for mechanized production of electrodes, and contact welding. (K1, ST)

178-K. High-Production Methods of Welding in Boiler Construction. (In Russian.) I. D. Davydenko. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 14-17.
Introduction of automatic welding into boiler production, rapid welding with exposed arc, and contact butt welding. A new universal, 3-electrode, 3-phase automatic welding head. Operating characteristics and prospects of further development. (K1, CN)

179-K. High-Production Methods for Welding Large-Capacity Freight Cars. (In Russian.) N. D. Portnoi. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 17-19.
Application of automatic welding under flux and of manual arc welding using large-diameter electrodes to production of freight cars. Optimum conditions of operation. (K1, CN)

180-K. High-Speed Double-Arc Automatic Welding. (In Russian.) B. I. Medovar. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 20-23.
Apparatus and procedure. Fundamental advantages of double-arc welding, in which one electrode is held perpendicular to the weld and the other is inclined to it, include division of total power required for high-speed welding between two arcs, decrease of welding current required for each arc, use of electrode wire of not over 6-mm. diameter, and possibility of using ordinary vitreous fluxes. 10 ref. (K1)

181-K. Application of Electric-Arc Welding to Large Structures. (In Russian.) V. I. Mel'nik. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 23-26.
Advances of the post-war 5-year plan in application of automatic arc welding to heavy construction, for instance, spherical gas storage tanks, blast furnaces, etc. Problems yet to be solved. (K1, CN)

182-K. Electrodes With High-Quality Coatings and Their Production. (In Russian.) E. V. Sokolov. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 26-29.
Results of several investigations in the technology of electrode production, including utilization of mass-production techniques and development of special types of electrodes. (K1, T5)

183-K. Automatic Welding of Copper Under Flux. (In Russian.) N. A. Olshanskii. *Avtogennoe Delo* (Welding), v. 21, Nov. 1950, p. 30-32.
Method and apparatus. Welding Cu by use of a carbon arc under flux produces a high-quality weld, does not require preheating, and guarantees high productivity. Automatic welding setup and operating characteristics for sheet thicknesses up to 8 mm. (K1, Cu)

184-K. How to Weld Aluminum. *Sheet Metal Worker,* v. 42, Feb. 1951, p. 41-44; Mar. 1951, p. 46-49, 54.
Detailed instructions for various sheet Al alloys. (K general, Al)

185-K. Arc-Welding Stainless Steel Without Columbium. Richard K. Lee. *Machinery* (American), v. 57, Mar. 1951, p. 191-192; **Stainless Arc Welded Without Columbium,** *Steel,* v. 128, Mar. 19, 1951, p. 71-72.
How corrosion resistance may be obtained without use of Cb by welding extra-low-carbon steels with extra-low-carbon electrodes. (K1, SS)

186-K. How Britain Builds Tanks. *Machinery* (American), v. 57, Mar. 1951, p. 143-151.

Miscellaneous fabrication equipment and procedures—mainly welding and machining set-ups. (K general, G17, CN)

187-K. Brazing and Bronze Welding in Maintenance and Manufacture. *Machinery* (American), v. 57, Mar. 1951, p. 180-183.

Typical applications for both types of work. Recommended practices. (K8)

188-K. Induction Heating Successfully Solders Aluminum. C. H. Yetman. *Iron Age*, v. 167, Mar. 15, 1951, p. 108-109.

Setup which provides uniform heat diffusion and eliminates oxidation problems. A high-strength bond was obtained at a rate of 320 pieces per hr. (K7, Al)

189-K. Welding Quality Control in a Petroleum Refinery. A. F. Blumer. *Welding Journal*, v. 30, Mar. 1951, p. 235-243. (K9, S12)

190-K. Nickel Portion of A.W.S. 1950 Educational Lecture Series. R. M. Wilson, Jr. *Welding Journal*, v. 30, Mar. 1951, p. 247-256.

Properties of high-Ni alloys, and procedures using metal-arc, inert-gas metal-arc, atomic-hydrogen, gas, and resistance welding; and brazing and cutting. (K general, G22, Ni)

191-K. Suggested New Welding Standards. David Arnott. *Welding Journal*, v. 20, Mar. 1951, p. 257.

Discusses paper by James F. Lincoln (Sept. 1950 issue; item 558-K, 1950). Indicates that the problem is not as simple as stated by Mr. Lincoln. (K9, S22)

192-K. Arc Welding in Home Building. John D. Bert. *Welding Journal*, v. 30, Mar. 1951, p. 263-264.

How arc welding can be applied to on-the-spot construction of steel homes of conventional and varied designs. (K1, T26, CN)

193-K. Automatic Welding on Propane Tanks. C. G. Herbruck. *Welding Journal*, v. 30, Mar. 1951, p. 268.

Good fixturing is speeding the automatic hidden-arc welding of propane cylinders at Creamer and Dunlap, Tulsa, Okla. (K1, ST)

194-K. Aircomatic Welding of Nickel and Stainless-Clad Steels. T. T. Watson and R. R. Rothermel. *Welding Journal*, v. 30, Mar. 1951, p. 116s-122s.

Details of development of procedures. Hardness survey plots and bend-test specimens. (K1, K9, Ni, SS, CN)

195-K. Some Research Techniques for Studying Arcs in Inert Gases. R. H. Gillette and R. T. Breymeier. *Welding Journal*, v. 30, Mar. 1951, p. 146s-152s.

Some selected techniques for obtaining fundamental data on inert-gas-shielded welding arcs. Interpretations of some of the phenomena observed. (K1, K9)

196-K. Hidden Arc Welding Done in Any Position. *Steel*, v. 128, Mar. 19, 1951, p. 76, 78.

Setup developed by Lincoln Electric Co. The joint is stationary as two electrodes are moved along opposite sides of work. Flux is carried on a moving belt so it is stationary in relation to the work. (K1)

197-K. Use of Welding to Facilitate Piping Suspension and Support. George W. Hauck. *Heating, Piping & Air Conditioning*, v. 23, Mar. 1951, p. 83-87.

A variety of examples. (K general, T27, CN)

198-K. Giant Welded Pipeline. W. J. Granberg. *Industry & Welding*, v. 24, Mar. 1951, p. 30, 33.

Steel-lined Soap Lake siphon in Eastern Washington is over 22 ft. in diam. Forming, handling, and automatic welding procedures and equipment. (K1, CN)

199-K. Design of Welding Fixtures. Hans W. Smith. *Industry & Welding*, v. 24, Mar. 1951, p. 34-36, 39.

Clarified by diagrams. (K general)

200-K. Organization for Quality Fabrication. A. Grodner. *Industry & Welding*, v. 24, Mar. 1951, p. 44-46, 48-49, 56-57.

Manual arc welding procedures and equipment of Alloy Fabricators, Perth Amboy, N. J., manufacturers of stainless steel equipment. Includes forming, heat treatment and inspection. (K1, A5, SS)

201-K. Stamped Torque Converter Breeds Production Problems. *SAE Journal*, v. 59, Mar. 1951, p. 17-21. (Based on "Problems Involved in Joining Sheet Metal for Torque Converters," by H. O. Flynn).

Choice of material for vaned members of the Chevrolet converter was narrowed down to three—cast iron, aluminum, and sheet steel. Fabricating methods tried and abandoned with each. Use of sheet-steel stampings joined by copper brazing was finally chosen. (K8, T21, ST)

202-K. Stud Welding to Ferrous and Nonferrous Metals. T. L. Hufert, P. F. Powder, and J. Nater. *Product Engineering*, v. 22, Mar. 1951, p. 89-91.

Question-and-answer survey. (K1)

203-K. Tricky Welding at Tecler. Howard E. Jackson. *Welding Engineer*, v. 36, Mar. 1951, p. 17-19, 22.

Manufacture of window frames by welding Al extruded sections at Tecler Aluminum Products, Seattle, Wash. Gas welding, metal-arc welding and inert-arc welding are used. (K1, K2, Al)

204-K. Braze Welding a 13-Ton Casting. Francis L. Maier. *Welding Engineer*, v. 36, Mar. 1951, p. 20-22.

Altogether, 325 lb. of Mn bronze were deposited in a crack 2 ft. long. (K8, CI)

205-K. Lighter Weight Means Less Labor. J. R. Thorpe. *Welding Engineer*, v. 36, Mar. 1951, p. 23.

Arc-weld fabrication of Mg dockboards for ship loading and unloading. (K1, Mg)

206-K. Controlled Explosions Test Welded Plates. Jack Medoff. *Welding Engineer*, v. 36, Mar. 1951, p. 24-25.

Direct-explosion test procedure for evaluating the performance of armor and ship-plate weldments. Unlike the conventional ballistic test, it is not affected by the variables inherent in a method that depends upon projectile impact. (K9, ST)

207-K. They Hung From the Roof to Build the Walls. Margaret Ralston. *Welding Engineer*, v. 36, Mar. 1951, p. 26-27.

Arc weld fabrication of large gas holder. Welders worked from three levels of scaffolding lifted by a new kind of "sky hook"—the roof on an air-pressure elevator. (K1, T26, CN)

208-K. Monel Outboard for Salt Water. Harold Schrock. *Welding Engineer*, v. 36, Mar. 1951, p. 28-29.

Use of spot and seam welding to make watertight seals in Monel rowboats. (K3, T22, Ni)

209-K. How Northrop Aircraft, Inc., Standardizes Its Flash Welding. Fred M. Burt. *Welding Engineer*, v. 36, Mar. 1951, p. 30-33.

Details of welding, inspection, and testing procedure. (K3, S13)

210-K. Capacitor-Operated Stud Welders. *Welding Engineer*, v. 36, Mar. 1951, p. 36-37.

Unit developed by Graham Mfg. Corp., Ferndale, Mich., to permit high-production welding operations. This equipment will weld studs to very thin plated or painted metals and can be used to weld dissimilar metals. (K1)

211-K. Joining Cast Iron. C. O. Burgess. *Machine Design*, v. 23, Mar. 1951, p. 129-131. (Based on "Welding, Joining and Cutting Gray Iron," to be published by Gray Iron Founders' Society.)

Development of gas and arc welding and brazing processes for the cast iron. Applicability of each process. (K1, K2, K8, CI)

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CLEANING, COATING AND FINISHING

146-L. Flame Sprayed Plastic Coatings. Bernard Goldberg. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 47-50.

The history of flame spraying. Guns and containers used for applying plastic powders. Problems involved in producing suitable powders of tough non-friable resins. Properties of flame sprayed Thiokol. Improvements in flame-spraying technique. Effect of after-treatments. Experimental work on producing flame-sprayed fluorinated-hydrocarbon coatings. Production of smooth non-porous coatings of hot-melt compositions. (L26)

147-L. Some Factors Affecting Paint Performance on Cathodically Protected Steel. Arnold J. Eickhoff and David L. Hawke. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 70-74.

Some fundamental considerations and results of laboratory work using five types of pigmented vehicles having greatly differing alkali resistance. Solvent-cleaned cold rolled steel panels were coated and tested in 3% NaCl and 5% NaOH solutions while coupled to Mg panels or to carbon rods with an imposed external emf. (L26, R11, ST)

148-L. Chemical Removal of Copper From Boilers. R. G. Call and W. L. Webb. *Transactions of the American Society of Mechanical Engineers*, v. 73, Feb. 1951, p. 125-129; disc., p. 129-133.

When acid-cleaning a 1,000,000-lb. per hr. boiler for removal of deposits which were predominantly iron oxide, the boiler metal was heavily plated with Cu. During subsequent operation this Cu became detached in large sheets which affected circulation adversely, making Cu removal mandatory. A solvent was developed containing $(NH_4)_2S_2O_8$, NH_4OH, and NaOH which removed about 300 lb. of Cu. Procedures. results, and costs. (L12, ST, Cu)

149-L. Phosphoric-Acid Cleaning of Boilers. T. E. Purcell and S. F. Whirl. *Transactions of the American Society of Mechanical Engineers*, v. 73, Feb. 1951, p. 135-139.

Because of the limitations and adverse effects of HCl, the possibility of using phosphoric acid for boiler cleaning was investigated. Inhibited phosphoric acid is a good solvent without the unfavorable properties and characteristics of inhibited HCl acid. This material has been used successfully for removing rust and mill scale from a new boiler. (L12, ST)

150-L. Chrome Plating Electrotype and Stereotype Printing Plates. Axel Lundbye. *Printing Equipment Engineer*, v. 81, Jan. 1951, p. 26-27; Feb. 1951, p. 44-46.

The process and its applications, not only to printing plates, but to a variety of printing-equipment parts to increase their wear resistance. (L17, T9)

151-L. High-Speed Paint Spray Line Uses Electrostatic Method. *Die Castings*, v. 9, Feb. 1951, p. 42, 44, 52.

Method applied to large die-cast Zn Alloy record-changer bases made. (L26, Zn)

152-L. Some Results of Experimental Work on the Suspension and Biscuit Strength of Vitreous Enamels. H. Laithwaite. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 185-188; *Foundry Trade Journal*, v. 90, Feb. 1, 1951, p. 123-126. (L27, ST)

153-L. A Study of the Use of Lithium in Vitreous Enamels. S. Hallsworth. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 189-192.

Effects of Li additions to various types of vitreous enamels were studied. (L27, ST)

154-L. Electrodeposition of Thallium; Improved Method Claimed by Italian Research. *Chemical Age*, v. 64, Feb. 3, 1951, p. 211-212.

Reviews work of E. Bertorelle and co-workers, *La Chimica et l'Industria*, v. 32, 1950, p. 517-522. (L17, Tl)

155-L. Small Parts Coated in Automatic Machine. *Iron Age*, v. 167, Feb. 22, 1951, p. 70.

Efficiency in painting or waxing of small steel parts is increased 200-300% in an automatically operated spinning cabinet at Tinnerman Products, Inc., Cleveland. (L26, ST)

156-L. Metal Finishing Forges Ahead. Adolph Bregman. *Iron Age*, v. 167, Feb. 22, 1951, p. 78-82.

See abstract of "Advances in Production Methods in Metal Finishing", *Metal Progress*, item 73-L, 1951. (L general)

157-L. Antimony Plate. Adolph Bregman. *Metal Progress*, v. 59, Feb. 1951, p. 245-247.

Pure Sb resists attack by HCl and HF, is relatively tarnish resistant, and is easily buffed to a highly reflective surface. Successful plating techniques which make it a substitute for the more critical metals, Ni and Cr. (L17, Sb)

158-L. Protection of Refractory Metals. *Metal Progress*, v. 59, Feb. 1951, p. 288, 290. (Translated and condensed from "Surface Protection of High-Melting Metals to Increase Their Sealing Resistance at High Temperatures," Helmut Buckle.)

Previously abstracted from *Metallforschung*. See item 7c-42, 1948. (L general, W, Mo, Cb, Ta, EG-d, SG-h)

159-L. Finishing Military Aircraft. Part II. Chemical Surface Treatments. Gilbert Close. *Industrial Finishing*, v. 27, Feb. 1951, p. 22-24, 26, 28, 30, 32, 37. (L14, Al)

160-L. How Simplification Cuts Costs in Finishing Hot Water Heaters. Howard E. Jackson. *Industrial Finishing*, v. 27, Feb. 1951, p. 38-40, 42, 44, 46.

Procedures and equipment for degreasing, attaching trim, sanding, spray painting, and baking. (L12, L26)

161-L. Speedy Production Setup for Painting Small Parts. *Industrial Finishing*, v. 27, Feb. 1951, p. 48-49.

Automatically operated dip-whirl coating machine at Tinnerman Products, Inc., Cleveland, manufacturer of fasteners. (L26)

162-L. Methods of Evaluating Aircraft Primers. Edward T. Nelson. *Organic Finishing*, v. 12, Feb. 1951, p. 12-15; disc. p. 15-17.

Previously abstracted from *ASTM Bulletin*. See item 583-L, 1950. (L14, Al, Mg, ST)

163-L. Continuous Cascade Pickling. W. H. Stuck and J. H. Abrams. *Iron and Steel Engineer*, v. 28, Feb. 1951, p. 101-106, 108.

Equipment and procedures at Jones & Laughlin Steel Corp.'s Aliquippa works. (L12, CN)

164-L. Inspection of Pipe Coating. Marshall E. Parker. *World Oil*, v. 132, Mar. 1951, p. 178, 180, 182, 184, 186, 188.

Use of primers, enamels, felts, glass reinforcements and outer wraps. Procedural recommendations. Work of the inspector. (L26, S13, ST)

165-L. A Note on Thin Nickel Foils. Stanley Bashkin and Gerson Goldhaber. *Review of Scientific Instruments*, v. 22, Feb. 1951, p. 112-113.

Preparation by electrodeposition of Ni foils down to 250 Å thick, for experimental use. (L17, Ni)

166-L. The Deposition of Rhodium on Perspex. B. L. Ginsborg and O. S. Heavens. *Review of Scientific Instruments*, v. 22, Feb. 1951, p. 114-115.

Vacuum-evaporation technique used for experimental purposes. (L25, Rh)

167-L. Hot Applied Coal Tar Coatings. N. T. Shideler. *Petroleum Engineer*, v. 23, Feb. 1951, p. D5-D8, D10; Mar. 1951, p. D18, D20, D22, D24.

Manufacture, properties, application, and testing of coal tar coatings for steel pipelines. Second part: significance of laboratory tests and what happens in service. Recommended application procedures. (L26, CN)

168-L. Aluminum Cleaning. D. F. Seymour. *Die Castings*, v. 9, Feb. 1951, p. 37-40, 59-62; Mar. 1951, p. 41-44, 57, 67-71.

Methods and equipment, especially as applied to die-cast parts. (L12, Al)

169-L. Manufacturing Applications of Liquid Impact Blasting. B. H. Marks. *Tool Engineer*, v. 26, Mar. 1951, p. 45-47.

Various modifications of the process. Varied applications, including wet blasting the edges of Bible pages to improve the bonding of gold leaf. (L10)

170-L. Uniform High Quality Finish Obtained With Diamond Powder Abrasives. S. G. Kelley, Jr. *Materials & Methods*, v. 33, Feb. 1951, p. 65-67.

How closely graded diamond compounds can save many man-hours in the finishing and polishing of hard molds, dies, and tools. (L10)

171-L. Polishing and Plating at Repcal Brass Manufacturing Co. George H. Kent. *Products Finishing*, v. 15, Feb. 1951, p. 22-24, 26. (L10, L17, Cu)

172-L. New Finish System Promises High Erosion Resistance. Gilbert C. Close. *Products Finishing*, v. 15, Feb. 1951, p. 30-32.

Two-coat system incorporating synthetic resins and rubber developed by Minnesota Mining and Mfg. Co. for aerodynamic leading edges of high-speed military airplanes. Tests indicate this coating will serve as well for other uses where high erosion or abrasion resistance is required. (L26)

173-L. Electroforming for Plastics. *Modern Plastics*, v. 28, Mar. 1951, p. 81-84, 86-87, 90.

How spray masks and specialized molds for plastic products are accurately produced by electroplating copper shells over prepared matrices. (L18, Cu)

174-L. Electrodeposition of Rhenium-Nickel Alloys. L. E. Netherton and M. L. Holt. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 106-109.

Deposition from an ammoniacal citrate bath and from Ni-plating baths containing potassium perrhenate. The ammoniacal citrate bath was used to determine effects of such factors as bath composition, bath pH, bath temperature, and current density on cathode current efficiency and alloy composition. Some of the properties of electrodeposited Re-Ni alloys. (L17, Re, Ni)

175-L. The Relationship Between Orientation, Grain Size, and Brightness in Nickel Electrodeposits. G. L. Clark and S. H. Simonsen. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 110-115.

A large number of electrodeposited Ni panels, deposited under varied conditions, were examined by improved X-ray diffraction techniques. Orientation and grain size were evaluated in order to determine whether or not any correlation exists between these characteristics and the fundamental optical property of brightness. X-ray grain sizes of matte, semi-bright, and bright deposits were found to be of the same order of magnitude. No correlation was found between orientation and brightness. 25 ref. (L17, M27, P17, Ni)

176-L. Attempts to Electrodeposit Zirconium. M. L. Holt. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 33C-35C.

Attempts were made to electrodeposit Zr and Zr alloys from numerous aqueous and nonaqueous solutions. None of the solutions used gave a weighable electrodeposit of pure Zr, but some solutions gave thin cathode deposits which contained Zr and Fe. No work with fused-salt baths for Zr is included. 14 ref. (L17, Zr)

177-L. Porcelain Enamel—Stronger Than You Think. W. A. Deringer. *Iron Age*, v. 167, Mar. 8, 1951, p. 85-87.

Contrary to popular opinion, porcelain enamel will not crack or chip from steel until the yield point of the base metal is reached or exceeded. It fails only after a certain amount of strain, which has no relation to the strength of the metal. Results of experiments at A. O. Smith Corp. 11 ref. (L27, ST)

178-L. A Highly Mechanized Plant for Sinks, Bath-tubs and Kitchen Cabinets. Warren Walker and Matt E. Heuertz. *Finish*, v. 8, Mar. 1951, p. 25-28, 58.

Facilities of Kaiser Metal Products, Inc., Bristol, Pa. Includes press operations, automatic spray pickling, and porcelain enameling. (L27, L12, G1, CN)

179-L. Three-Coat Paint System for Coastal Regions. J. G. Ford and A. J. Kuti. *Finish*, v. 8, Mar. 1951, p. 31-33, 56-57.

See abstract of "Mica-Base Paint System Doubles Transformer Tank Life," *Steel*, item 753-L, 1950. (L26, ST)

180-L. Low Pressure Spraying of Porcelain Enamel. R. S. Sheldon. *Finish*, v. 8, Mar. 1951, p. 35-37, 54-55, 80.

Advantages, material characteristics, and equipment used to secure savings in excess of $50,000 for a single year at Frigidaire Div., General Motors Corp. (L27, CN)

181-L. Preventing Corrosion With Protective Paint Coatings. George Diehlman and E. L. Beenfeldt. *Corrosion* (Technical Section), v. 7, Mar. 1951, p. 88-92.

Factors to be considered in formulation and proper use of red-lead paints. A classification of red-lead paints according to intended exposure conditions, and a reference listing of current specifications useful as a procurement basis. Factors governing performance of paint coatings: nature of metal to be coated, surface preparation, intended environmental conditions, and paints, primers, and topcoats. Results of exposure after use of various surface-preparation methods and application schedules. (L26)

182-L. Planning Keeps Roper With the Leaders. *Ceramic Industry*, v. 56, Mar. 1951, p. 60-61, 63-64, 104.

Equipment and procedures of Geo. D. Roper Corp. for production of porcelain-enameled gas ranges. Includes press operations, pickling, and finishing. (L27, G1, CN)

183-L. Unit Mechanizes Steel Lubricating. *Ceramic Industry,* v. 56, Mar. 1951, p. 66-67.

A 4-stage unit designed to take the variables out of preparing steel for deep drawing operations, which makes the operation completely automatic. The steel is cleaned, rinsed, lubricated, and dried. (L12, G21, ST)

184-L. The Electroplating Industry in Atlanta. I. Victor J. Baran. *Plating,* v. 38, Mar. 1951, p. 243-247.

Believed to be the first unbiased and detailed study of the plating industry in any city in the U. S. Tremendous growth of the plating industry, which has occurred in the South since the last war. Certain weaknesses in the organization and management of job plating shops. (L17)

185-L. Rotogravure Roll Making. *Plating,* v. 38, Mar. 1951, p. 248-252.

Procedures and equipment. Two copper layers separated by a passive nickel film are applied to a steel roll. The design is etched on the outer layer. (L18, Cu)

186-L. Cover Coat Application Directly on Steel. M. E. McHardy. *Better Enameling,* v. 22, Feb. 1951, p. 6-7, 35.

See abstract under similar title from *Refrigerating Engineering,* item 827-L, 1950. (L27, CN)

187-L. Formulation of Industrial Finishes (Metal). M. A. Glaser. *Official Digest,* June 1950, p. 418-443.

A comprehensive descriptive review. (L general)

188-L. Coastal Finish Extends Life of Distribution Transformers. J. G. Ford and A. J. Kuti. *Westinghouse Engineer,* v. 11, Mar. 1951, p. 42-45.

See abstract of "Mica-Base Paint System Doubles Transformer Tank Life," *Steel,* item 753-L, 1950. (L26, ST)

189-L. The Role of the Vehicle in Paints for Submerged Surfaces. A. C. Elm. *Paint, Oil & Chemical Review,* v. 114, Mar. 1, 1951, p. 13-14, 16, 32, 34.

Fundamental principles and their practical application to painting of underwater structures to prevent fouling and corrosion of metal surfaces. (L26)

190-L. Control of Electroplating Solutions by Analysis and Observation. XIII. The Choice and Control of Cleaning Solutions. K. E. Langford. *Electroplating and Metal Finishing,* v. 4, Feb. 1951, p. 41-44.

(L17, L12)

191-L. Molybdenum in Metal Spraying by the Wire Process. R. Corbett. *Electroplating and Metal Finishing,* v. 4, Feb. 1951, p. 45-48.

Spraying and properties of Mo coatings on specially polished surfaces. Mo will adhere to brightly polished steels normally used in machine construction. Coatings have been produced to which steel and other metals will adhere, so that Mo may be used as a flash coating on polished surfaces where use of the usual shot blasting procedure is inconvenient. (To be continued.) (L23, Mo)

192-L. Electrochemical and Electrometallurgical Industries. J. O'M. Bockris. *Reports on the Progress of Applied Chemistry,* v. 34, 1949, p. 152-167.

Electrodeposition, electrorefining, and electropolishing. 101 ref. (L17, L13, C23, D8, Fe)

193-L. Multiple Finishing at Beatty Bros. H. N. Acker. *Canadian Metals,* v. 14, Feb. 1951, p. 38-40.

Wide range of finishing operation including galvanizing, electroplating, painting, and enameling. (L general)

194-L. Zinc Spraying. *Engineering & Chemical Digest,* v. 2, Dec. 1950, p. 440-446. (From ZDA Technical Memo No. 12.)

Comparatively analyzes three methods. Applications in protection of iron and steel against corrosion. (L23, Zn, ST)

195-L. Chemical Films for Metals. R. H. Warring. *Machinery Lloyd* (Overseas Edition), v. 23, Feb. 17, 1951, p. 79.

(L14)

196-L. The Measurement of Throwing Power and the Prediction of Thickness Distribution. G. E. Gardam. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 77-81; disc. p. 93-94.

Results of experiments and conclusions. (L17)

197-L. Throwing Power in Alloy Deposition. J. W. Cuthbertson. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 81-83; disc. p. 93-94. (Preprint.)

Discusses the fact that it is possible to have a reasonable good throwing power with respect to thickness associated with a poorer throwing power with respect to composition and vice versa. Deposition of Sn-Cu alloy speculum in a bright form from a speculum electrolyte modified by certain addition agents is an example. (L17, Cu, Sn)

198-L. Practical Implications of Throwing Power. S. Wernick. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 83-92; disc., p. 93-94. (Preprint.)

The determination of throwing power using cathodes of varying geometric shapes; and determining the distribution of thickness of the deposit over the surface by using the Clark jet test. Results of Ni plating. (L17, Ni)

199-L. Electrodeposits as Bases for Paints. H. Silman and Dorothy Wernick. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 175-187. (Preprint.)

The value of electrodeposits as undercoats for paint. Electrotinned and electogalvanized steel. Test methods and results. (L17, L26, Sn, Zn, ST)

200-L. Detergents for Use in the Aluminium Industry. P. G. Clements. *Light Metals,* v. 14, Feb. 1951, p. 104-108.

Theory and practice of degreasing Al and its alloys with alkaline solutions. Equipment. (L12, Al)

201-L. Construction of a Small-Scale Sheet-Galvanizing Unit. M. L. Hughes and I. E. Thomas. *Journal of the Iron and Steel Institute,* v. 167, Jan. 1951, p. 46-47.

Small galvanizing unit, large enough to hold about 6 cwt. of zinc, constructed at the BISRA laboratories, was designed to galvanize sheets of 8-in. width and of any convenient length, in a manner essentially similar to that employed in industry. Sheets were successfully galvanized at various speeds, bath temperatures, and bath compositions. (L16, Zn, CN)

202-L. A Survey of Coating-Thickness Variation on Commercially Galvanized Sheets. M. L. Hughes. *Journal of the Iron and Steel Institute,* v. 167, Jan. 1951, p. 48-65.

Distribution of coating thickness on representative samples of commercially galvanized steel sheets was studied. Results of measurements along, across, and upon either side of the sheets, and the probable relationship between different types of thickness variation and existing techniques of galvanizing. (L16, S14, Zn, CN)

203-L. Ceramic and Metallic Bodies. (In German.) Friedrich Reinhart. *Sprechsaal für Keramik; Glas; Email,* v. 84, Jan. 10, 1951, p. 5-7.

Patented methods of coating ceramic articles with precious metals or their alloys. (L general, EG-c)

204-L. Methods for Evaluating the Quality of Anodic Oxide Castings. (In Italian.) G. Missier and W. Ruff. *Alluminio,* v. 19, No. 6, 1950, p. 515-522.

Experimental investigation of different methods for determining thickness and durability of anodic oxide coatings on Al. (L19, S14, Al)

205-L. Chemical Oxidation of Aluminum and Its Alloys. (In Italian.) *Alluminio,* v. 19, No. 6, 1950, p. 569-575.

Various processes for producing protective oxide coatings by chemical treatment. Details of time, temperature, and bath composition. 18 ref. (L14, Al)

206-L. Diffusion of Hydrogen in Steels of Different Carbon Contents During Acid Etching (In Russian.) S. A. Balezin and D. Ya. Solovei. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the U.S.S.R.), new ser., v. 75, Dec. 21, 1950, p. 811-814.

Several pickling inhibitors, including thiourea, diethyl aniline, thiodiglycol, etc., were investigated for steels containing 0.14-1.20% C and nominal percentages of Si, Mn, S, and P. (L12, N1, CN)

207-L. Hot Paint Spraying Saves Finishing Materials, Labor. Henry J. Holtz. *Steel,* v. 128, Mar. 12, 1951, p. 85-86.

As applied to metal finishing. (L26)

208-L. Composite Metal Fabrication by Arc Welding. H. E. Cable. *Welding Journal,* v. 30, Mar. 1951, p. 258-262.

Several examples of surfacing of bearings for resistance to galling, and for resistance to corrosion. (L24, T7)

209-L. Removing Discoloration From Stainless Steel. *Welding Journal,* v. 30, Mar. 1951, p. 271.

Simple electrolytic apparatus. (L13, SS)

210-L. Steel Warehouse Building Flame Cleaned Without Necessity for Work Shutdown. *Welding Journal,* v. 30, Mar. 1951, p. 272.

Illustrated. (L10, CN)

211-L. Automatic Transmission Castings Cleaned Chemically. R. J. Peters. *Iron Age,* v. 167, Mar. 15, 1951, p. 105-107.

New adaptation of the Kolene cleaning technique which produces gray iron castings of unusual surface quality. Surface sand inclusions are dissolved, and all scale and rust are removed. Machine-shop rejects are minimized, since the process uncovers porosity and cracks for visual inspection. (L12, SI)

212-L. National Bureau of Standards Opens New Laboratory for Durability Studies of Protective Coatings. *Better Enameling,* v. 22, Mar. 1951, p. 22-23.

(L27, A9)

213-L. Availability of Finishes for Die Castings. *Die Castings,* v. 9, Mar. 1951, p. 20-21, 60.

Various types and their availability during the emergency. Mentions mainly Zn die castings. (L general, Zn)

214-L. Chemically-Inert Synthetic Enamel Required for Microscopes. Charles Hendershott. *Die Castings,* v. 9, Mar. 1951, p. 27, 34.

Finishing procedures for Al and Zn die castings used in Bausch & Lomb microscopes. (L26, Al, Zn)

215-L. Abrasive Blast Plus Anodizing Yields Inert, Uniform Surface. J. E. Willing. *Die Castings,* v. 9, Mar. 1951, p. 33, 60.

Application to diecast Al parts for railway-signal equipment. (L10, L19, Al)

216-L. How an Organic Coating Solved a Design Problem at Philco. *Die Castings,* v. 9, Mar. 1951, p. 36-38, 63.

Difficulty encountered in matching color among five brass-plated Zn die castings resulted in a change to a metallic hammertype baked enamel. This solved the color matching problem, eliminated rejects, saved polishing, and stepped up production rate. (L26, Zn, Cu)

217-L. Foundry Cleaning Costs Cut $250 Per Day. *Steel,* v. 128, Mar. 19, 1951, p. 76.

Table-room rotoblast unit cleans large castings at savings over former methods of $150 per day in breakage and $11.20 in labor. (L10, E24, CI)

218-L. Hardfacing—a Design Tool. J. J. Barry. *Machine Design,* v. 23, Mar. 1951, p. 114-119.

Hard facing has always been considered as a maintenance and repair process rather than a design tool. Shows that the process is also of value in production of miscellaneous items in which a wear resistant surface is desirable. Recommended procedures and applications, including recommendations for alloy selection. (L24, SG-m)

219-L. Metal Colouring; Methods of Treatment for Iron and Steel Smallware. C. Harris. *Metal Industry,* v. 78, Feb. 23, 1951, p. 143-146.

Details of various formulas. (L14, Fe, ST)

220-L. Magnesium Alloy Surface Treatment; Importance of Chemical Buffering. L. F. Le Brocq. *Metallurgia,* v. 43, Feb. 1951, p. 53-61.

Good buffering power is an important practical requirement for chromate treatment baths for the protection of Mg alloys. Buffering properties of the hot ½-hr. chromate bath at pH 6. Good buffering of a cold chromate bath at pH 4 to 5 can be obtained by addition of chrome alum or preferably potash alum. Action of alkali on potash alum. (L14, Mg)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

50-M. Natural Width of a Grain Boundary in a Metal. J. L. Snoek. *Journal of Applied Physics,* v. 22, Jan. 1951, p. 109.

Natural width is defined as the width observed in the complete absence of internal strains and of impurities. This width may be expected to be a function of the relative orientation of the adjacent crystals only. Problems involved in determining this width. (M27)

51-M. A Simple Camera for Taking X-Ray Powder Patterns at Elevated or Reduced Temperatures. L. F. Connell, Jr., and H. C. Martin, Jr. *American Journal of Physics,* v. 19, Feb. 1951, p. 127-128. (M23)

52-M. Relation of Structure of Stainless Steel to Hot Ductility. F. K. Bloom, W. C. Clarke, Jr., and P. A. Jennings. *Metal Progress,* v. 59, Feb. 1951, p. 250-256.

The hot-twist test first described by Sauveur and reported on in more detail by Ihrig and by Clark and Russ was used to investigate above relation for the various types of stainless steel. Photomicrographs illustrate structures of the different alloys following different heat treatments. 10 ref. (M27, Q23, SS)

53-M. New Uses of X-Rays and of Electron Diffraction. J. J. Trillat. *Transactions of the New York Academy of Sciences,* ser. 2, v. 13, Dec. 1950, p. 52-59.

Some new methods developed at the X-Ray Laboratory of the National Center of Scientific Research, Bellevue, France. These are divided into three classes: methods involving use of photo-electrons (electron radiography); methods involving diffraction of X-rays (study of surface structure); and methods involving diffraction of electrons (study of fresh metallic surfaces and their properties.) (M22, M23)

54-M. Fine Structure of Metals and Alloys. U. Dehlinger and H. Nowotny. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 1-55.

Reviews the chemical physics of alloys, including a section on the kinetics of allotropic transformations. Crystal structure of intermetallic phases. 195 ref. (M26, N6)

55-M. Microscopic and Roentgenographic Testing. A. Schrader, H. Mahl, W. Hofmann, and H. Neerfield. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 195-231.

Production of microsections and etchings, electron microscopy, structure determination by X-rays, and X-ray measurements of elastic stresses. 132 ref. (M21, Q25)

56-M. Examination of Metals Under Polarized Light. II. Applications. B. W. Mott and H. R. Haines. *Research,* v. 4, Feb. 1951, p. 63-73.

83 references. (M21)

57-M. A Sheet Specimen Scanner for X-Ray Diffraction. D. J. Neil. *Canadian Journal of Technology,* v. 29, Feb. 1951, p. 84-86.

An improved and simple design. Simultaneous back-reflection and transmission photographs at distances of 3 and 5 cm. respectively and any glancing angle from 0° to 90° are possible. Useful exposures can be obtained with times as low as 10 min. (M22)

58-M. Discussion on "The Nature and Uses of Diffraction," A. E. W. Austen and N. Hendry; "The Influence of Surface Behaviour on the Characteristics of Electrodeposits," A. T. Steer. *Journal of the Electrodepositors' Technical Society,* v. 25, 1950, p. 147-161. (Preprint.)

Joint discussion and authors' replies. (M22, L17)

59-M. Sigma-Phase in the Co-Cr and Fe-Cr Systems. G. J. Dickins, Audrey M. B. Douglas, and W. H. Taylor. *Journal of the Iron and Steel Institute,* v. 167, Jan. 1951, p. 27.

Several Fe-Cr alloys of compositions near 50 atomic % Cr were studied. A powder pattern characteristic of the σ-phase was identified. Compares results with those of other investigators. (M26, Co, Cr, Fe)

60-M. Structure of the Sigma-Phase in the Iron-Chromium and Cobalt-Chromium Systems. G. J. Dickins, Audrey M. B. Douglas, and W. H. Taylor. *Nature,* v. 167, Feb. 3, 1951, p. 192.

See preceding abstract under similar title from *Journal of the Iron and Steel Institute.* (M26, Fe, Cr, Co)

61-M. Single-Crystal Neutron Diffraction Analysis. R. D. Lowde. *Nature,* v. 167, Feb. 10, 1951, p. 243-244.

Technique which permits use of a small single crystal in conjunction with a pile of only moderate neutron flux. It has several advantages over prevailing methods. (M22)

62-M. Electrolytic Oxidation and Polishing of Titanium and Their Application in Investigation of Microstructures. (In French.) Pierre A. Jacquet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 3, 1951, p. 71-73.

Method for rapid electropolishing of Ti and its alloys which makes it possible to obtain a truer picture of their microstructures. The polished surface may be etched by standard etching acids. Also, anodic oxidation produces an oxide film, the color of which depends on the crystal structure of the base metal. (M21, Ti)

63-M. Correlation Between Jernkontoret Fracture Number and JKM Grain Size of Hardened Steels. (In Swedish.) B. D. Enlund. *Jernkontorets Annaler,* v. 134, No. 11, 1950, p. 545-552.

In hardened steels of high carbon content, it is very difficult to develop the austenitic grain boundaries by etching. On Jernkontoret fracture-test pieces, very lightly ground on one side, it was possible to see the grain boundaries after etching on account of a slight surface decarburization. A very good linear correlation was obtained between JKM grain size determined in this way and Jernkontoret fracture number. Grain-size determinations on samples etched by means of the Bain-Vilella method did not give satisfactory correlation. (M27, CN)

64-M. Fracture Number, Austenitic Grain Size and Martensitic Structure. (In Swedish.) B. D. Enlund. *Jernkontorets Annaler,* v. 134, No. 11, 1950, p. 553-555.

A carbon steel containing 0.77% C was quenched from 1000° C. at different cooling rates in order to produce variation in the martensitic structure. The fracture as determined by means of the Jernkontoret standard fracture test was not influenced by variation in treatment but remained constant. The fracture therefore seems to depend on the austenitic grain size and to be independent of quenched structure, at least for coarse grains. (M27, CN)

65-M. Note on Silicon Distribution Between Austenite and Liquid Metal in Freezing Hypo-Eutectic Cast Iron. (In Swedish.) *Jernkontorets Annaler,* v. 134, No. 11, 1950, p. 556-558.

It was found that during freezing, the Si content of the mother liquor of a hypo-eutectic cast iron gradually decreases and the phosphorus content increases. This is a qualitative confirmation of Si distribution between austenite and liquid metal as shown in the Jass diagram of 1935. (M24, CI)

66-M. Structure of Spherulites in Nodular Cast Iron. H. E. Stauss, F. W. Von Batchelder, and E. I. Salkovitz. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 249.

Results of X-ray studies. Concludes that the spherulites consist of aggregates of crystallites aligned radially to some extent. (M26, CI)

67-M. Intergranular Energy of Iron and Some Iron Alloys. Lawrence H. Van Vlack. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 251-259.

Energy of the γ-Fe grain boundary was found to be 850 ergs per sq. cm. at 1105° C. The α/α and α/γ boundaries possess somewhat less energy. Microstructures of several Fe alloys are discussed in terms of interfacial-energy relationships. 24 ref. (M27, P10, Fe)

68-M. Precipitation and Diffuse Scattering in an Fe-Mo-Co Alloy. A. H. Geisler and F. E. Steigert. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 259-260.

The permanent-magnet alloy "Comol," which contains 17% Mo, 12% Co, balance Fe, exhibits a precipitation reaction analogous to that at the iron end of the binary Fe-Mo system. (M24, N7, Fe, SG-n)

69-M. Bibliography of Electron Microscopy. Claire Marton, Samuel Sass, Max Swerdlow, Alan VanBronkhorst, and Harold Meryman. *National Bureau of Standards,* Circular 502, Aug. 1, 1950, 87 pages.

Covers books and survey articles on instrumentation, electron optics, related instruments, and applications prior to Jan. 1, 1950. (M21)

70-M. A New Type of X-Ray Scattering. *Nature,* v. 167, Feb. 24, 1951, p. 313-314.

Experimental results show that modification of the parent beam due to partial absorption in the lattice occurs in the case of metals, semiconductors, and insulators. (M22)

71-M. The Crystal Structure of Graphite in Cast Iron. W. S. Owen and B. G. Street. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 113-116.

Structures of graphite extracted from an Fe-C-Si alloy prepared from high-purity materials, and graphites from a variety of commercial cast irons were studied by an X-ray powder method. In all cases the structure was a mixture of the *a* and *b* structures found in other graphites of different origin. A correlation between microscopic appearance and crystal structure was established. Parameters of the unit cell were measured. Since no variation from the accepted value for pure graphite was found, it is concluded that the graphite occurring in Fe-C-Ci alloys and in commercial cast irons is practically pure carbon. 20 ref. (M26, N8, CI)

72-M. The Carbide Phase in Iron-Carbon-Silicon Alloys. W. S. Owen. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 117-120.

Dimensions of the unit cell of the crystal structure of the carbide phase extracted from a plain-carbon steel, a commercial white iron, a high-purity vacuum-melted Fe-C-Si alloy, and a similar alloy melted in air, were measured by a Debye-Scherrer, powder X-ray method. No variation in dimensions of the cell was found. Concludes that Si in Fe-C-Si alloys does not enter the carbide phase. This indicates that the position commonly accepted for the peritecto-eutectic point in the metastable diagram of the ternary system is probably considerably in error. 25 ref. (M24, M26, CI, Fe)

73-M. Phase-Contrast Microscopy in the Study of Metal Surfaces. D. McLean. *Metal Treatment and Drop Forging,* v. 18, Feb. 1951, p. 51-62.

The possibility of adapting ordinary microscopes to phase-contrast illumination. Includes comparative photomicrographs. (M21)

74-M. The Manipulation and Temperature Calibration of High-Temperature Debye-Scherrer X-Ray Cameras. R. L. Berry, W. G. Henry, and G. V. Raynor. *Journal of the Institute of Metals,* v. 78, Feb. 1951, p. 643-656.

Experiments designed to test temperature distribution between the furnaces of a Unicam high-temperature Debye-Scherrer X-ray camera. Reliability of internal calibration of the measuring thermocouple in terms of lattice spacings of a standard substance at various temperatures. Concludes that no method involving moving thermocouples is entirely satisfactory. A reliable method for determining temperature gradients in the specimen has been developed, involving attachment of fine thermocouples to copper wires, which are mounted in the position occupied by the specimen. Experiments on internal calibration vs. lattice spacings of pure silver show clearly that emissivities of standard and experimental specimens should be as nearly as possible identical. (M22, S16)

75-M. Effect of Crystal, Grain, and Particle Size on X-Ray Power Diffracted From Powders. (In English). Zigmond W. Wilchinsky. *Acta Crystallographica,* v. 4, Jan. 1951, p. 1-9.

A theoretical and experimental investigation was made on diffraction of X-rays from crystalline powders in which diffracted power is modified by powder coarseness and absorption inhomogeneities in the sample. Magnitude of the diffracted power is related to particle diameter, linear absorption coefficient, degree of compaction of the powder, crystal size, primary extinction coefficient, crystal-chemical composition, and grain size for polyphase particles. Theoretical predictions for a W-Fe mixture were substantiated experimentally. Measurements on heat treated Fe samples show that diffracted power decreases with increasing crystal size. 17 ref. (M22, W, Fe)

76-M. Existence and Structure of a New Phase in the System Mo-B. (In French). F. Bertaut and P. Blum. *Acta Crystallographica,* v. 4, Jan. 1951, p. 72.

Measurements showing existence of an MoB_2 phase. (M24, Mo, B)

77-M. Occurrence and Investigation of Oxide Inclusions in Steel. (In German.) Walter Koch. *Berichte der Deutschen Keramischen Gesellschaft e.V. und des Vereins Deutscher Emailfachleute e.V.,* v. 27, Sept.-Oct. 1950, p. 293-310.

Discusses, from the standpoint of the ceramic engineer, the metallurgical causes and prevention of oxide inclusions, their effects on the adhesiveness of enamels, and methods for separating them from steel. 12 ref. (M28, L27, ST)

N
TRANSFORMATIONS AND RESULTING STRUCTURES

60-N. Calculation of Diffusion Penetration Curves for Surface and Grain Boundary Diffusion. J. C. Fisher. *Journal of Applied Physics,* v. 22, Jan. 1951, p. 74-76.

In order to facilitate quantitative investigation of grain boundary and surface diffusion, a mathematical analysis of the problem was completed, assuming that grain-boundary diffusion is analogous to diffusion of heat along a thin copper foil imbedded in cork. Calculated diffusion-penetration relationship for grain-boundary diffusion is shown to agree with the experimentally determined grain-boundary self-diffusion of silver. (N1)

61-N. Precipitation and the Domain Structure of Alnico 5. A. H. Geisler. *Physical Review,* ser. 2, v. 81, Feb. 1, 1951, p. 478-479.

Shows that internal spontaneous fields in the domain structure of the matrix exert an important influence on the precipitation process in Alnico 5. (N7, P16, SG-n)

62-N. The Effects of Alloying Elements in Steel. II. Joseph K. Stone, Jr. *Industrial Heating,* v. 18, Feb. 1951, p. 248, 250, 252, 254, 256, 258, 260, 327.

Factors affecting austenite on continuous cooling and its relation to transformation at constant temperatures. (N8, ST)

63-N. Alloys of Al-Zn-Mg-Cu. *Metal Progress,* v. 59, Feb. 1951, p. 284, 286. (Condensed from "Recent Researches on Aluminum-Zinc-Magnesium-Copper Alloys," A. Saulnier and G. Gabane, *Revue de Métallurgie,* v. 46, Jan. 1949, p. 13-23.)

Work of other investigators and new experimental work using dilatometric and X-ray procedures. Emphasizes phase transformations and mechanical properties resulting from variations in heat treatment and composition. (N6, Q general, Al)

64-N. Changes of State. E. Scheil, O. Kubaschewski, and W. Hofmann. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 137-165.

A review covering physical properties and crystallization of metal melts, diffusion in metals, and transformations in the solid state. 78 ref. (N general, P general)

65-N. Plastic Deformation and Recrystallization. A Kochendörfer. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 166-194.

A general review. 106 ref. (N5, Q24)

66-N. The Permeability of Zirconium to Hydrogen. Richard B. Bernstein and Daniel Cubicciotti. *Journal of Physical and Colloid Chemistry,* v. 55, Feb. 1951, p. 238-248.

Experimental apparatus and procedure. Effects of various factors. 12 ref. (N1, Zr)

67-N. Silicon Distribution in Freezing Hypo-Eutectic Cast Iron. A. Hultgren and O. Carlsson. *Foundry Trade Journal,* v. 90, Feb. 8, 1951, p. 151-152.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 50-N, 1951. (N8, M24, CI)

68-N. Pearlitic Malleable Cast Iron. (In French.) Jean Guillamon. *Fonderie,* Dec. 1950, p. 2301.

Two methods for production: first, transformation of blackheart malleable iron with ferritic structure by heating above the Ac_1 transformation point, followed by rapid cooling; second, heating white cast iron above the Ac_1 point for a time sufficient for decomposition of cementite, followed by rapid cooling. (N8, CI)

69-N. Thermo-Elastic Analysis of Transformations in Aluminum Bronzes (In French.) Robert Cabarat, Léon Guillet, René Le Roux, and Albert Portevin. *Comptes Rendus hebomadaires des Séances de l'Académie des Sciences,* v. 231, Dec. 18, 1950, p. 1373-1375.

Solid-state transformations of a Cu-Al alloy (11.95% Al) were studied using a special apparatus. A strong heat treatment influence was observed. (N6, Cu)

70-N. Influence of Amplitude and Rate of Plastic Deformation on Diffusion of Hydrogen in Iron and Steel. (In French.) Paul Bastien and Pierre Azou. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 3, 1951, p. 69-71.

Investigated using specimens saturated with hydrogen by 48-hr. exposure to 10% HCl + 0.01% Na_2S in water. A tensile test was applied for periods varying from 0.07 sec. to 2 hr., 20 min. In the absence of preliminary plastic deformation, hydrogen had little effect. (N1, Q24, Fe, ST)

71-N. Recrystallization of Austenite Caused by Internal Stresses (In Russian.) K. A. Malyshev, V. D. Sadovskii, and B. G. Sazonov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the U.S.S.R.), new ser., v. 76, Jan. 1, 1951, p. 61-64.

Experimental investigation showed that crystallization of steel during heat treatment is a complex phenomenon consisting of phase transformation, recrystallization, and grain growth. Internal stresses formed during heating of austenite above its critical point are caused by volumetric changes taking place under such conditions. (N5, N8, ST)

72-N. Internal Adsorption of Silver in Platinum. (In Russian.) V. I. Arkharov, E. V. Samova, and T. P. Chukina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 11, 1951, p. 209-210.

A Pt + 0.5% Ag solid solution was held at 1180° C. (melting point of Ag) for 2 hr., quenched in water and treated with aqua regia. On repeating this treatment cycle up to 80 times, a product having a higher Ag content on the surface than in the interior was obtained. This fact is said to support the senior author's theory of "internal adsorption." (N1, Ag, Pt)

73-N. On the Volume Shrinkage Due to Solidification of Some Cadmium-Base Alloys. (In English.) Tomo-o Sato and Hideo Kaneko. *Technology Reports of the Tohoku University*, v. 14, No. 2, 1950, p. 30-44.

Shrinkage of Cd and many Cd-base alloys, such as Cd-Ni, Cd-Ag, Cd-Cu, Cd-Hg, Cd-Ag-Cu, Cd-Ni-Hg, Cd-Ni-Cu and Cd-Hg-Cu, and relations between volume shrinkage and composition, were studied. 11 ref. (N12, Cd)

74-N. Studies on Selenium and Its Alloys. Report I. Physical Properties of Selenium. (In English.) Tomo-o Sato and Hideo Kaneko. *Technology Reports of the Tohoku University*, v. 14, No. 2, 1950, p. 45-54.

Phase transformations of Se. Rate of crystallization and heat of crystallization were determined, also a number of physical properties. Dependence of electrical resistance upon conditions of heat treatment and upon temperature. 16 ref. (N6, P15, Se)

75-N. Microscopic Observation of the Solidification of Cu-Ni Alloy Droplets. R. E. Cech and D. Turnbull. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 242-243.

The solidification behavior of Cu-Ni alloy droplets containing 88.93, 80.62, and 72.27% Cu was studied as a function of composition by means of a high-temperature microscopic technique. (N12, Cu)

76-N. Surface Diffusion in Sintering of Spheres on Planes. P. Schwed. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 245-246.

Mathematical analysis without restriction on region of diffusion. This procedure is different from that of Cabrera, who assumed that diffusion occurs only in the region outside the neck. (N1, H15)

77-N. Re-Solution of Precipitated Silver in Copper-Silver Alloys. Harold Margolin and Walter R. Hibbard, Jr. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 247.

X-ray investigation revealed formation of a "discontinuous" type of solution on aging a Cu + 5% Ag alloy, first at 550, then at 600° C. Two sets of Cu-base lines, corresponding to the two temperatures, were observed. A possible mechanism is suggested. (N7, Cu)

78-N. Electron-Diffraction Study of the Order-Disorder Transformation of the Alloy $AuCu_3$. (In French.) H. Raether. *Acta Crystallographica*, v. 4, Jan. 1951, p. 70-71.

12 ref. (N10, M22, Au, Cu)

79-N. Low-Temperature Instability of Intermetallic Phases. (In English.) O. J. Kleppa and Donald F. Clifton. *Acta Crystallographica*, v. 4, Jan. 1951, p. 74.

An endothermic process is indicated for the phase Au_2Pb, which is formed peritectically from practically pure gold and the liquid solution at 418° C. It is expected that at lower temperatures, this compound will break down to give free Au and free Pb, or some other intermetallic phase, by a very slow diffusion transformation. However, a suitable combination of cold work and temperature should speed the decomposition. Work which indicates validity of theoretical predictions. (N9, Au, Pb)

80-N. Three New Polymorphs of Silicon Carbide, 8H, 75R, and 84R. (In English.) L. S. Ramsdell and J. A. Kohn. *Acta Crystallographica*, v. 4, Jan. 1951, p. 75.

(N6, C-n, Si)

81-N. On the Rate of Order-Disorder Transformation in β-Brass. (In English.) Yutaka Takagi, Takehiko Oguchi, and Gen Shirane. *Japan Science Review*, v. 1, Sept. 1950, p. 65-70.

Theoretical, mathematical analysis. Includes graphical interpretation. (N10, Cu)

P

PHYSICAL PROPERTIES AND TEST METHODS

70-P. Secondary Emission of Nickel-Barium Mixtures and Rhenium When Bombarded by Electrons With Energies From 50 to 8000 Electron-Volts. H. E. Farnsworth and M. J. Lun. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 77-79.

Results of work on an alloy of Ni + 1.5% Ba and on rhenium. (P15, Ni, Re)

71-P. A Note on the Metallic Behavior of $MoSi_2$. Frank W. Glaser. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 103.

Electrical resistivity and temperature coefficient of resistivity were measured for $MoSi_2$ prepared by cold pressing and sintering. Results indicate that noninterstitial compounds between transition metals and nonmetals may also have metallic properties, as is the case with interstitial compounds. (P15, Mo, Si)

72-P. Plasticity and Conductivity; Analogous Flow Phenomena in Copper Alloys. Rolland Sydney French. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 105-106.

Analyzes and correlates experimental data. Relationships between plastic deformation and electrical conductivity are shown graphically. (P15, Q23, Cu)

73-P. The Entropies of Melting of Metals. R. A. Oriani. *Journal of Chemical Physics*, v. 19, Jan. 1951, p. 93-97.

The melting process is conceived as consisting of an expansion, followed by a disordering of the crystal structure. The entropy contribution from the first effect is calculated by analogy with the process occurring in volume expansion within an individual phase; the entropy contribution from the melting disorder is then obtained by difference from the measured entropy of fusion. Tentative conclusions are drawn from the relative magnitudes of the various quantities. A simple model for the melting process is adopted, making possible a correlation between amount of disordering during melting and structural contribution to entropy of melting. (P12)

74-P. The Thermodynamic Properties of Gaseous Titanium. Paul W. Gilles and Quentin de L. Wheatley. *Journal of Chemical Physics*, v. 19, Jan. 1951, p. 129-130.

Results of calculations for the ideal monatomic gas in the range 0 to 5000° K. 11 ref. (P12, Ti)

75-P. Liquid Metal Heat-Transfer Coefficients. Richard N. Lyon. *Chemical Engineering Progress* (Transactions Section), v. 47, Feb. 1951, p. 75-79.

A simple means of calculating heat transfer in liquid metals. Small-scale handling methods have also been developed. If these methods can be scaled up to industrial size, the potentialities of liquid metals as heat-transfer media can be fully realized. 15 ref. (P11)

76-P. Measurements of Gamma-Ray Absorption Coefficients. Charlotte Meaker Davisson and Robley D. Evans. *Physical Review*, v. 81, Feb. 1, 1951, p. 404-411.

Absorption of γ-rays in Al, Cu, Sn, Ta, and Pb was measured. Tests showed that scattering from nearby objects and from the absorber were negligible. Tests of the absorption of radium γ-rays in Pb showed good agreement with other workers and with theory. 23 ref. (P10, Al, Cu, Sn, Ta, Pb)

77-P. Interaction Between the *d* Shells in the Transition Metals. C. Zener. *Physical Review*, v. 81, Feb. 1, 1951, p. 440-444.

Review of the crystal structure and of the magnetism of the transition elements has led to very simple principles which appear to govern the interaction between the incomplete *d* shells of neighboring atoms. The body-centered cubic structure of the transition metals V, Cr, Cb, Mo, Ta, and W is thereby interpreted, as well as more complex lattices of certain alloys. 12 ref. (P16, M26, V, Cr, Cb, Mo, Ta, W)

78-P. Low Temperature Resistance Minimum in Magnesium Measured by a Mutual Inductance Method. H. E. Rorschach and Melvin A. Herlin. *Physical Review*, ser. 2, v. 81, Feb. 1, 1951, p. 467.

A method which may prove to be useful for many types of low-temperature resistance measurements. (P15, Mg)

79-P. Ferromagnetic Resonance in Various Ferrites. W. A. Yager, F. R. Merritt, and Charles Guillaud. *Physical Review*, ser. 2, v. 81, Feb. 1, 1951, p. 477-478.

Results of ferromagnetic-resonance experiments at room temperature and at a frequency of 24, 164 mc. per sec. on spherical polycrystalline specimens of Mg, Ni, Co, Mn, and Mn-Zn ferrites. (P16, Mg, Ni, Co, Mn, Zn, SG-n,p)

80-P. Pure Metals. *Metal Progress*, v. 59, Feb. 1951, p. 280, 282. (Condensed from "Metallurgy Behind the Decimal Point", Earle E. Schumacker.)

Previously abstracted from *Journal of Metals*. See item 272-P, 1950. (P15, P16, Q23, Pb, Si, Ge, SG-n, p)

81-P. The Vapor Pressure of Gold and the Activities of Gold in Gold-Copper Solid Solutions. Lewis D. Hall. *Journal of the American Chemical Society*, v. 73, Feb. 1951, p. 757-760.

Experimental procedures and apparatus. Radioactive gold was used as a tracer. The technique is also applicable to vapor-pressure measurement of other metals. 15 ref. (P12, Au, Cu)

82-P. The Mutual Solubility of Mercury and Gallium. William M. Spicer and Henry W. Bartholomay. *Journal of the American Chemical Society*, v. 73, Feb. 1951, p. 868-869.

Results of experiments are tabulated and discussed. (P13, Ga, Hg)

83-P. Melting and Crystal Structure. A. R. Ubbelohde. *Quarterly Reviews*, v. 4, No. 4, 1950, p. 356-381.

Theoretical and experimental studies on changes in thermodynamic and other properties of metals

69-M. Bibliography of Electron Microscopy. Claire Marton, Samuel Sass, Max Swerdlow, Alan VanBronkhorst, and Harold Meryman. *National Bureau of Standards,* Circular 502, Aug. 1, 1950, 87 pages.

Covers books and survey articles on instrumentation, electron optics, related instruments, and applications prior to Jan. 1, 1950. (M21)

70-M. A New Type of X-Ray Scattering. *Nature,* v. 167, Feb. 24, 1951, p. 313-314.

Experimental results show that modification of the parent beam due to partial absorption in the lattice occurs in the case of metals, semiconductors, and insulators. (M22)

71-M. The Crystal Structure of Graphite in Cast Iron. W. S. Owen and B. G. Street. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 113-116.

Structures of graphite extracted from an Fe-C-Si alloy prepared from high-purity materials, and graphites from a variety of commercial cast irons were studied by an X-ray powder method. In all cases the structure was a mixture of the *a* and *b* structures found in other graphites of different origin. A correlation between microscopic appearance and crystal structure was established. Parameters of the unit cell were measured. Since no variation from the accepted value for pure graphite was found, it is concluded that the graphite occurring in Fe-C-Ci alloys and in commercial cast irons is practically pure carbon. 20 ref. (M26, N8, CI)

72-M. The Carbide Phase in Iron-Carbon-Silicon Alloys. W. S. Owen. *Journal of the Iron and Steel Institute,* v. 167, Feb. 1951, p. 117-120.

Dimensions of the unit cell of the crystal structure of the carbide phase extracted from a plain-carbon steel, a commercial white iron, a high-purity vacuum-melted Fe-C-Si alloy, and a similar alloy melted in air, were measured by a Debye-Scherrer, powder X-ray method. No variation in dimensions of the cell was found. Concludes that Si in Fe-C-Si alloys does not enter the carbide phase. This indicates that the position commonly accepted for the peritecto-eutectic point in the metastable diagram of the ternary system is probably considerably in error. 25 ref. (M24, M26, CI, Fe)

73-M. Phase-Contrast Microscopy in the Study of Metal Surfaces. D. McLean. *Metal Treatment and Drop Forging,* v. 18, Feb. 1951, p. 51-62.

The possibility of adapting ordinary microscopes to phase-contrast illumination. Includes comparative photomicrographs. (M21)

74-M. The Manipulation and Temperature Calibration of High-Temperature Debye-Scherrer X-Ray Cameras. R. L. Berry, W. G. Henry, and G. V. Raynor. *Journal of the Institute of Metals,* v. 78, Feb. 1951, p. 643-656.

Experiments designed to test temperature distribution between the furnaces of a Unicam high-temperature Debye-Scherrer X-ray camera. Reliability of internal calibration of the measuring thermocouple in terms of lattice spacings of a standard substance at various temperatures. Concludes that no method involving moving thermocouples is entirely satisfactory. A reliable method for determining temperature gradients in the specimen has been developed, involving attachment of fine thermocouples to copper wires, which are mounted in the position occupied by the specimen. Experiments on internal calibration vs. lattice spacings of pure silver show clearly that emissivities of standard and experimental specimens should be as nearly as possible identical. (M22, S16)

75-M. Effect of Crystal, Grain, and Particle Size on X-Ray Power Diffracted From Powders. (In English). Zigmond W. Wilchinsky. *Acta Crystallographica,* v. 4, Jan. 1951, p. 1-9.

A theoretical and experimental investigation was made on diffraction of X-rays from crystalline powders in which diffracted power is modified by powder coarseness and absorption inhomogeneities in the sample. Magnitude of the diffracted power is related to particle diameter, linear absorption coefficient, degree of compaction of the powder, crystal size, primary extinction coefficient, crystal-chemical composition, and grain size for polyphase particles. Theoretical predictions for a W-Fe mixture were substantiated experimentally. Measurements on heat treated Fe samples show that diffracted power decreases with increasing crystal size. 17 ref. (M22, W, Fe)

76-M. Existence and Structure of a New Phase in the System Mo-B. (In French). F. Bertaut and P. Blum. *Acta Crystallographica,* v. 4, Jan. 1951, p. 72.

Measurements showing existence of an MoB_2 phase. (M24, Mo, B)

77-M. Occurrence and Investigation of Oxide Inclusions in Steel. (In German.) Walter Koch. *Berichte der Deutschen Keramischen Gesellschaft e.V. und des Vereins Deutscher Emailfachleute e.V.,* v. 27, Sept.-Oct. 1950, p. 293-310.

Discusses, from the standpoint of the ceramic engineer, the metallurgical causes and prevention of oxide inclusions, their effects on the adhesiveness of enamels, and methods for separating them from steel. 12 ref. (M28, L27, ST)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

60-N. Calculation of Diffusion Penetration Curves for Surface and Grain Boundary Diffusion. J. C. Fisher. *Journal of Applied Physics,* v. 22, Jan. 1951, p. 74-76.

In order to facilitate quantitative investigation of grain boundary and surface diffusion, a mathematical analysis of the problem was completed, assuming that grain-boundary diffusion is analogous to diffusion of heat along a thin copper foil imbedded in cork. Calculated diffusion-penetration relationship for grain-boundary diffusion is shown to agree with the experimentally determined grain-boundary self-diffusion of silver. (N1)

61-N. Precipitation and the Domain Structure of Alnico 5. A. H. Geisler. *Physical Review,* ser. 2, v. 81, Feb. 1, 1951, p. 478-479.

Shows that internal spontaneous fields in the domain structure of the matrix exert an important influence on the precipitation process in Alnico 5. (N7, P16, SG-n)

62-N. The Effects of Alloying Elements in Steel. II. Joseph K. Stone, Jr. *Industrial Heating,* v. 18, Feb. 1951, p. 248, 250, 252, 254, 256, 258, 260, 327.

Factors affecting austenite on continuous cooling and its relation to transformation at constant temperatures. (N8, ST)

63-N. Alloys of Al-Zn-Mg-Cu. *Metal Progress,* v. 59, Feb. 1951, p. 284, 286. (Condensed from "Recent Researches on Aluminum-Zinc-Magnesium-Copper Alloys," A. Saulnier and G. Gabane, *Revue de Métallurgie,* v. 46, Jan. 1949, p. 13-23.)

Work of other investigators and new experimental work using dilatometric and X-ray procedures. Emphasizes phase transformations and mechanical properties resulting from variations in heat treatment and composition. (N6, Q general, Al)

64-N. Changes of State. E. Scheil, O. Kubaschewski, and W. Hofmann. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 137-165.

A review covering physical properties and crystallization of metal melts, diffusion in metals, and transformations in the solid state. 78 ref. (N general, P general)

65-N. Plastic Deformation and Recrystallization. A Kochendörfer. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 166-194.

A general review. 106 ref. (N5, Q24)

66-N. The Permeability of Zirconium to Hydrogen. Richard B. Bernstein and Daniel Cubicciotti. *Journal of Physical and Colloid Chemistry,* v. 55, Feb. 1951, p. 238-248.

Experimental apparatus and procedure. Effects of various factors. 12 ref. (N1, Zr)

67-N. Silicon Distribution in Freezing Hypo-Eutectic Cast Iron. A. Hultgren and O. Carlsson. *Foundry Trade Journal,* v. 90, Feb. 8, 1951, p. 151-152.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 50-N, 1951. (N8, M24, CI)

68-N. Pearlitic Malleable Cast Iron. (In French.) Jean Guillamon. *Fonderie,* Dec. 1950, p. 2301.

Two methods for production: first, transformation of blackheart malleable iron with ferritic structure by heating above the Ac_1 transformation point, followed by rapid cooling; second, heating white cast iron above the Ac_1 point for a time sufficient for decomposition of cementite, followed by rapid cooling. (N8, CI)

69-N. Thermo-Elastic Analysis of Transformations in Aluminum Bronzes (In French.) Robert Cabarat, Léon Guillet, René Le Roux, and Albert Portevin. *Comptes Rendus hebomadaires des Séances de l'Académie des Sciences,* v. 231, Dec. 18, 1950, p. 1373-1375.

Solid-state transformations of a Cu-Al alloy (11.95% Al) were studied using a special apparatus. A strong heat treatment influence was observed. (N6, Cu)

70-N. Influence of Amplitude and Rate of Plastic Deformation on Diffusion of Hydrogen in Iron and Steel. (In French.) Paul Bastien and Pierre Azou. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 3, 1951, p. 69-71.

Investigated using specimens saturated with hydrogen by 48-hr. exposure to 10% HCl + 0.01% Na_2S in water. A tensile test was applied for periods varying from 0.07 sec. to 2 hr., 20 min. In the absence of preliminary plastic deformation, hydrogen had little effect. (N1, Q24, Fe, ST)

71-N. Recrystallization of Austenite Caused by Internal Stresses (In Russian.) K. A. Malyshev, V. D. Sadovskii, and B. G. Sazonov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the U.S.S.R.), new ser., v. 76, Jan. 1, 1951, p. 61-64.

Experimental investigation showed that crystallization of steel during heat treatment is a complex phenomenon consisting of phase transformation, recrystallization, and grain growth. Internal stresses formed during heating of austenite above its critical point are caused by volumetric changes taking place under such conditions. (N5, N8, ST)

72-N. Internal Adsorption of Silver in Platinum. (In Russian.) V. I. Arkharov, E. V. Samova, and T. P. Chukina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 76, Jan. 11, 1951, p. 209-210.

A Pt + 0.5% Ag solid solution was held at 1180° C. (melting point of Ag) for 2 hr., quenched in water and treated with aqua regia. On repeating this treatment cycle up to 80 times, a product having a higher Ag content on the surface than in the interior was obtained. This fact is said to support the senior author's theory of "internal adsorption." (N1, Ag, Pt)

73-N. On the Volume Shrinkage Due to Solidification of Some Cadmium-Base Alloys. (In English.) Tomo-o Sato and Hideo Kaneko. *Technology Reports of the Tohoku University*, v. 14, No. 2, 1950, p. 30-44.

Shrinkage of Cd and many Cd-base alloys, such as Cd-Ni, Cd-Ag, Cd-Cu, Cd-Hg, Cd-Ag-Cu, Cd-Ni-Hg, Cd-Ni-Cu and Cd-Hg-Cu, and relations between volume shrinkage and composition, were studied. 11 ref. (N12, Cd)

74-N. Studies on Selenium and Its Alloys. Report I. Physical Properties of Selenium. (In English.) Tomo-o Sato and Hideo Kaneko. *Technology Reports of the Tohoku University*, v. 14, No. 2, 1950, p. 45-54.

Phase transformations of Se. Rate of crystallization and heat of crystallization were determined, also a number of physical properties. Dependence of electrical resistance upon conditions of heat treatment and upon temperature. 16 ref. (N6, P15, Se)

75-N. Microscopic Observation of the Solidification of Cu-Ni Alloy Droplets. R. E. Cech and D. Turnbull. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 242-243.

The solidification behavior of Cu-Ni alloy droplets containing 88.93, 80.62, and 72.27% Cu was studied as a function of composition by means of a high-temperature microscopic technique. (N12, Cu)

76-N. Surface Diffusion in Sintering of Spheres on Planes. P. Schwed. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 245-246.

Mathematical analysis without restriction on region of diffusion. This procedure is different from that of Cabrera, who assumed that diffusion occurs only in the region outside the neck. (N1, H15)

77-N. Re-Solution of Precipitated Silver in Copper-Silver Alloys. Harold Margolin and Walter R. Hibbard, Jr. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 247.

X-ray investigation revealed formation of a "discontinuous" type of solution on aging a Cu + 5% Ag alloy, first at 550, then at 600° C. Two sets of Cu-base lines, corresponding to the two temperatures, were observed. A possible mechanism is suggested. (N7, Cu)

78-N. Electron-Diffraction Study of the Order-Disorder Transformation of the Alloy $AuCu_3$. (In French.) H. Raether. *Acta Crystallographica*, v. 4, Jan. 1951, p. 70-71.

12 ref. (N10, M22, Au, Cu)

79-N. Low-Temperature Instability of Intermetallic Phases. (In English.) O. J. Kleppa and Donald F. Clifton. *Acta Crystallographica*, v. 4, Jan. 1951, p. 74.

An endothermic process is indicated for the phase Au_2Pb, which is formed peritectically from practically pure gold and the liquid solution at 418° C. It is expected that at lower temperatures, this compound will break down to give free Au and free Pb, or some other intermetallic phase, by a very slow diffusion transformation. However, a suitable combination of cold work and temperature should speed the decomposition. Work which indicates validity of theoretical predictions. (N9, Au, Pb)

80-N. Three New Polymorphs of Silicon Carbide, 8H, 75R, and 84R. (In English.) L. S. Ramsdell and J. A. Kohn. *Acta Crystallographica*, v. 4, Jan. 1951, p. 75.

(N6, C-n, Si)

81-N. On the Rate of Order-Disorder Transformation in β-Brass. (In English.) Yutaka Takagi, Takehiko Oguchi, and Gen Shirane. *Japan Science Review*, v. 1, Sept. 1950, p. 65-70.

Theoretical, mathematical analysis. Includes graphical interpretation. (N10, Cu)

P

PHYSICAL PROPERTIES AND TEST METHODS

70-P. Secondary Emission of Nickel-Barium Mixtures and Rhenium When Bombarded by Electrons With Energies From 50 to 8000 Electron-Volts. H. E. Farnsworth and M. J. Lun. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 77-79.

Results of work on an alloy of Ni + 1.5% Ba and on rhenium. (P15, Ni, Re)

71-P. A Note on the Metallic Behavior of $MoSi_2$. Frank W. Glaser. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 103.

Electrical resistivity and temperature coefficient of resistivity were measured for $MoSi_2$ prepared by cold pressing and sintering. Results indicate that noninterstitial compounds between transition metals and nonmetals may also have metallic properties, as is the case with interstitial compounds. (P15, Mo, Si)

72-P. Plasticity and Conductivity; Analogous Flow Phenomena in Copper Alloys. Rolland Sydney French. *Journal of Applied Physics*, v. 22, Jan. 1951, p. 105-106.

Analyzes and correlates experimental data. Relationships between plastic deformation and electrical conductivity are shown graphically. (P15, Q23, Cu)

73-P. The Entropies of Melting of Metals. R. A. Oriani. *Journal of Chemical Physics*, v. 19, Jan. 1951, p. 93-97.

The melting process is conceived as consisting of an expansion, followed by a disordering of the crystal structure. The entropy contribution from the first effect is calculated by analogy with the process occurring in volume expansion within an individual phase; the entropy contribution from the melting disorder is then obtained by difference from the measured entropy of fusion. Tentative conclusions are drawn from the relative magnitudes of the various quantities. A simple model for the melting process is adopted, making possible a correlation between amount of disordering during melting and structural contribution to entropy of melting. (P12)

74-P. The Thermodynamic Properties of Gaseous Titanium. Paul W. Gilles and Quentin de L. Wheatley. *Journal of Chemical Physics*, v. 19, Jan. 1951, p. 129-130.

Results of calculations for the ideal monatomic gas in the range 0 to 5000° K. 11 ref. (P12, Ti)

75-P. Liquid Metal Heat-Transfer Coefficients. Richard N. Lyon. *Chemical Engineering Progress* (Transactions Section), v. 47, Feb. 1951, p. 75-79.

A simple means of calculating heat transfer in liquid metals. Small-scale handling methods have also been developed. If these methods can be scaled up to industrial size, the potentialities of liquid metals as heat-transfer media can be fully realized. 15 ref. (P11)

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Experimental procedures and apparatus. Radioactive gold was used as a tracer. The technique is also applicable to vapor-pressure measurement of other metals. 15 ref. (P12, Au, Cu)

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Results of experiments are tabulated and discussed. (P13, Ga, Hg)

83-P. Melting and Crystal Structure. A. R. Ubbelohde. *Quarterly Reviews*, v. 4, No. 4, 1950, p. 356-381.

Theoretical and experimental studies on changes in thermodynamic and other properties of metals

and nonmetals near their melting points. 71 ref. (P12)

84-P. An Oscillation Type Magnetometer. J. H. E. Griffiths and J. R. MacDonald. *Journal of Scientific Instruments,* v. 28, Feb. 1951, p. 56-58.

A simple method of measuring saturation magnetization of thin plane samples of ferromagnetic materials. The sample performs oscillations in a uniform magnetic field about an axis in the plane of the sample and at right angles to the magnetic field. The method was tested by measurements on sheet Ni and Supermalloy 0.11 mm. thick and has been used with films of Ni down to 0.1 mm. thick.
(P16, Ni, SG-n, p)

85-P. The Properties of Evaporated Gold and Tungsten Oxides. P. G. Wilkinson. *Journal of Applied Physics,* v. 22, Feb. 1951, p. 226-232.

Gold blacks, prepared by evaporating gold from a tungsten filament, were found to contain tungsten oxides which greatly affected optical and electrical properties. Exposure to air or oxygen caused an increase in electrical resistance and optical transmission of films of WO_2 and WO_3 evaporated in high vacuum. It was concluded that evaporated films of pure gold are unaffected by exposure to air and that changes in optical and electrical characteristics of evaporated gold films exposed to air are caused by contamination with tungsten oxides. 17 ref.
(P15, P17, Au, W)

86-P. A Dynamic Method for Measuring the Specific Heat of Metals. Alan M. Nathan. *Journal of Applied Physics,* v. 22, Feb. 1951, p. 234-235.

Method applicable under conditions of rapidly increasing temperature (1000° C. per sec.) together with some results obtained with it. The method was used for a preliminary study of the specific-heat curves of low-carbon steel at the phase-transformation points. Includes circuit diagram and tabular data. (P12)

87-P. Growth of Germanium Single Crystals Containing p-n Junctions. G. K. Teal, M. Sparks, and E. Buehler. *Physical Review,* ser. 2, v. 81, Feb. 15, 1951, p. 637.

Technique of production and properties. The crystals have unusual rectifying characteristics.
(P15, N12, Ge)

88-P. Theory and Experiment for a Germanium *p-n* Junction. F. S. Goucher, G. L. Pearson, M. Sparks, G. K. Teal, and W. Shockley. *Physical Review,* ser. 2, v. 81, Feb. 15, 1951, p. 637-638.

Characteristics of the *p-n* junction. Technique of production and properties, and unusual rectifying characteristics. (P15, N12, Ge)

89-P. Theory of Alloys. O. Kubaschewski, E. Gebhardt, R. Vogel, Th. Heumann, and A. Schrader. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 64-136.

A review covering the thermochemistry of metals and alloys and the structure of binary, ternary, and quaternary alloys. 178 ref. (P12, M24)

90-P. A Theory of Basicity and Oxidation Applicable to Steelmaking. W. L. Kerlie. *Journal of the Iron and Steel Institute,* v. 167, Jan. 1951, p. 9-26.

Influence of slag basicity on distribution of FeO between slag and metal. A theory of oxidation and basicity is developed by which the equilibrium oxygen content of the liquid iron can be calculated with reasonable accuracy. Equilibrium constants for P and Mn reactions were evaluated and compared with constants based on analytical oxygen contents. Experiments in a basic bessemer converter showed that O_2 content of the steel is an important factor influencing final N_2 content. Examination of openhearth data shows the possibility of an improvement in technique. 29 ref.
(P12, D general, S Γ)

91-P. Concerning Progressive Intermittent Activation in Certain Series of Ferromagnetic Alloys (In French.) Robert Forrer. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 231, Dec. 18, 1950, p. 1444-1446.

Rhode's hypothesis of intermittent activation is theoretically analyzed and experimentally verified for Fe-Ni (γ-phase), Pt-Co, Pt-Cr, and Pt-Mn alloys. Shows that Ni and Co promote intermittent activation in γ-Fe and Pt, which themselves are not ferromagnetic.
(P16, SG-n, p, Fe, Ni, Co, Cr, Mn)

92-P. Dilatometric Study of Metallic Neodymium. (In French.) Félix Trombe and Marc Foex. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 3, 1951, p. 63-65.

Investigated on quite pure material, in the range −195 to 650° C.
(P11, Nd)

93-P. Tables of Constants. (In French.) Marc Foex and Alain Berton. "Les hautes Temperatures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 1259-1302.

Atomic weights of the elements; melting points of the elements; melting points of simple binary inorganic compounds and oxides; normal boiling points of elements and simple binary compounds and oxides; vapor pressures of the elements as a function of temperature; thermal conductivity of some elements and alloys; and thermal conductivity of refractory materials. (Values obtained by various investigators are shown, with source, in most cases.) 549 ref. (P10, P11, P12)

94-P. The Characteristic Frequencies of Cylindrical Steel Bars. (In German.) R. Adolph, H. O. Kneser, and I. Schulz. *Annalen der Physik,* ser. 6, v. 8, Nov. 10, 1950, p. 99-104.

Torsion, expansion, and bending frequencies were accurately measured up to frequencies at which the wave length nearly equals the diameter of the bar. Bending frequencies are compared with those calculated according to Goens' method. Experimental apparatus and data. (P10, ST)

95-P. Temperature Dependence of Magnetic Viscosity. (In Russian.) R. V. Telesnin and E. F. Kuritsyna. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the U.S.S.R.), new ser., v. 75, Dec. 21, 1950, p. 797-798.

Investigated for the range 86-615° K., that is, up to about the Curie point. Method of investigation. The Ni used was 99.99% pure and had been annealed in hydrogen at 900° C. for 3 hr. (P16, Ni)

96-P. Some Remarks on the Equation of Thermionic Emission. (In English.) Yasushi Watanabe. *Technology Reports of the Tohoku University,* v. 14, No. 1, 1949, p. 1-9.

The equation of thermionic emission of a pure metal surface is expressed in two forms. Richardson's and Dushmann and Nordheim's equations. These equations have been usually regarded as independent of each other. Shows that the two equations are equivalent. (P15)

97-P. On the Equilibrium Between Iron, Sulphur and Hydrogen at High Temperature. (In English.) Sachio Matoba and Tatsuji Unotoro. *Technology Reports of the Tohoku University,* v. 14, No. 1, 1949, p. 60-76.

Presents details of experimental investigation. Part I covers reduction of FeS by H_2 and Part II the same reaction, except that the FeS is dissolved in molten Fe, as in steelmaking. 10 ref.
(P12, D general, Fe, ST)

98-P. Apparatus and Technique for Measuring Thermal Conductivity of Powdered Material. W. Z. Girton and J. H. Potter. *ASTM Bulletin,* Feb. 1951, p. 47-52.

Dry, powdered material is placed in the annular space between two concentric cylinders. Quantity of heat was measured by the temperature rise of the cooling water surrounding the outer cylinder. The powder was compacted in the test annulus by impressing a vibration of known amplitude and frequency upon the test cell for a specified time. Tests were made with samples of powdered zinc, carbonyl iron, copper-copper oxide eutectic, and calcium carbonate. (P11)

99-P. Electrical Resistivity of Coatings. Walter F. Rogers. *Petroleum Engineer,* v. 23, Mar. 1951, p. D5-D12, D14, D16.

A study of seven methods of measurement of electrical resistivity on pipelines to determine which coating is the most practicable.
(P15, L general, CN)

100-P. The Sorption of Gases on Metals at Room Temperature. A. L. McClellan and Norman Hackerman. *Journal of Physical & Colloid Chemistry,* v. 55, Mar. 1951, p. 374-382.

Results of investigation of sorption of O_2, Cl_2, NO, and NO_2 on chromium, 18-8 stainless steel, and ordinary steel at about 30° C.
(P13, Cr, SS, CN)

101-P. Sulphur Activities in Liquid Copper Sulphides. R. Schuhmann, Jr., and O. W. Moles. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 235-241.

An equilibrium study was made of the reaction: Cu_2S (liquid) + H_2 (gas) → Cu (dissolved) + H_2S (gas) at temperatures of 1150, 1250, and 1350° C.: for liquid Cu sulfides ranging in composition from saturation with Cu to about 21.5% S. From the experimental data, activities of Cu, S, and Cu_2S in the melts were calculated, as well as location of the curve showing the compositions of Cu-saturated sulfide melts in the Cu-S constitution diagram. 10 ref.
(P12, C21, Cu)

102-P. Solubility of Hydrogen in Molten Lead. W. R. Opie and N. J. Grant. *Journal of Metals,* v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 191, 1951, p. 244-245.

Results of determination are graphed and expressed in the form of an empirical equation. (P13, Pb)

103-P. High-Temperature Properties and Characteristics of a Ferritic Steam-Piping Steel. A. W. Rankin and W. A. Reich. *American Society of Mechanical Engineers,* Paper 50-A-76, 1950, 12 pages.

Mechanical and physical properties and manufacturing and heat treating characteristics of a Cr-Mo-V steel for turbine shells, valve casings, and steam leads at 900, 1000, and 1100° F.
(P general, Q general, Ay, SG-h)

104-P. (Book) **Liquid-Metals Handbook; A Guide to the Use of Liquid Metals as Heat-Transfer Media.** Richard N. Lyon, editor-in-chief. 188 pages. 1950. U. S. Atomic Energy Commission and U. S. Navy Dept., Washington, D. C.

Industrial utilization, physical and chemical properties, laboratory techniques, and availability of liquid metals. Resistance of materials to attack by liquid metals, liquid-metal heat transfer, and large-scale handling of some liquid metals. Covers metals and alloys melting below 660° C. (P general, R6, SG-d).

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

112-Q. Effects of Prior Stress on the Fatigue of Aluminum Alloys. *Technical News Bulletin* (National Bureau of Standards), v. 35, Feb. 1951, p. 19-20.

See abstract of complete version under similar title from *Journal of Research of the National Bureau of Standards*, item 15-Q, 1951. (Q7, Al)

113-Q. Comparative Strength of Some Adhesive-Adherend Systems. N. J. DeLollis, Nancy Rucker, and J. E. Wier. *Transactions of the American Society of Mechanical Engineers*, v. 73, Feb. 1951, p. 183-193.

One phase of an investigation of the nature of adhesion. The adhesives were polyvinyl acetate, cellulose nitrate, resorcinol resin, casein, gum arabic, natural rubber, and neoprene. The adherends were stainless steel, an Al alloy, paper-phenolic laminate, glass, birchwood, and hard rubber. Properties studied were double-lap shear, tensile, long-time loading shear, and impact strengths. 17 ref. (Q27, Q2, Q6, K12, SS, Al)

114-Q. On the Theory of Plastic Deformation. Doris Kuhlmann. *Proceedings of the Physical Society*, v. 64, sec. A, Feb. 1, 1951, p. 140-155.

A model for plastic deformation in soft metals is based on the assumption that in real crystals there is always a number of regions present which, by an unknown process, act as sources of dislocations. It is also assumed that in soft metals dislocations are very mobile except in a limited number of regions which act as obstacles. The model is applied to explain a number of facts connected with plastic deformation. 56 ref. (Q24)

115-Q. Factors Controlling Dislocation Widths. A. J. Foreman, M. A. Jaswon, and J. K. Wood. *Proceedings of the Physical Society*, v. 64, sec. A, Feb. 1, 1951, p. 156-163.

The work of Peierls and Nabarro is extended to a family of edge dislocations of greater widths. The theory is applied to bubble-raft dislocations, and satisfactory agreement found with experiment. 10 ref. (Q24)

116-Q. Measurement of Stresses in 115 RE Rail on Tangent Track—North Western Railway. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 690-704.

Part of "Report on Assignment 11: Recent Developments Affecting Rail Section," from Report of Committee 4 on Rail. Measured stresses are correlated with laboratory fatigue data. (Q25, Q7, CN)

117-Q. Determining the Relative Wear Resistance of Metals. I. F. Reed and E. D. Gordon. *Agricultural Engineering*, v. 32, Feb. 1951, p. 98-100.

Wear-test machine developed by the U. S. Dept. of Agriculture in which relative wear resistance of metals and alloys to a flow of sand past a moving disk is determined. Results are used to indicate suitability of the metals for soil-tillage tools of various types. 19 ref. (Q9, T3)

118-Q. Effect of Nuclear Radiation on Metals. J. T. Richards. *Metal Progress*, v. 59, Feb. 1951, p. 249.

Commenting on article of above title by D. S. Billington and Sidney Siegel (Dec. 1950 issue), the author proposes an alternative explanation for the increased hardness and resistivity noted after irradiation of beryllium-copper. (Q29, P15, Cu)

119-Q. Creep of Pure Zinc. *Metal Progress*, v. 59, Feb. 1951, p. 290, 294. (Condensed from "The Flow of Zinc Under Constant Stress", A. H. Cottrell and V. Aytekin.)

Previously abstracted from *Journal of the Institute of Metals*. See item 664-Q, 1950. (Q24, Q3, Zn)

120-Q. A Three-Dimensional Photoelastic Stress Analysis of a Threaded Drill Pipe Joint. William F. Franz. *Petroleum Engineer*, v. 23, Feb. 1951, p. B60-B62, B64-B65.

Details of methods used and results. (Q25)

121-Q. The Application of Various Hardness Testing Methods for Metallic Materials. *Industrial Diamond Review*, new ser., v. 11, Jan. 1951, p. 13-15. (Translated and condensed from "Draft DIN Standard", June 1950, Materialprüfungsamt, Berlin-Dahlem, Germany.)

Comparative survey of various hardness testing methods. (Q29)

122-Q. A Mechanical Determination of Biaxial Residual Stress in Sheet Materials. R. G. Treuting and W. T. Read, Jr. *Journal of Applied Physics*, v. 22, Feb. 1951, p. 130-134.

A method for determining residual stress in sheet material by removing successive uniform layers of material from the surface and measuring the resulting curvature. From condition of equilibrium of a free specimen, a stress vs. curvature relation is derived which applies when stress is constant in the plane of the specimen and varies with thickness. A practical example. (Q25)

123-Q. Dry Metallic Friction as a Function of Temperature Between 4.2° K. and 600° K. I. Simon, H. O. McMahon, and R. J. Bowen. *Journal of Applied Physics*, v. 22, Feb. 1951, p. 177-184.

Coefficients of static friction of six metals (Fe, Ni, Cu, Pb, Sn, and Zn) were measured in above range. Shear strengths and hardnesses were measured over the same range. Their ratio is in most cases dependent to only a slight extent on temperature. This fact tends to substantiate the adhesion theory of friction proposed by Bowden. 10 ref. (Q9, Fe, Ni, Cu, Pb, Sn, Zn)

124-Q. Causes and Prevention of Drill Collar Failure. Stanley C. Moore. *Drilling Contractor*, v. 7, Feb. 15, 1951, p. 60-63.

Design, stress, and corrosion factors and their influence on failures. (Q25, R general, ST)

125-Q. Plasticity. James B. Kelley. *Physics Today*, v. 4, Mar. 1951, p. 17-23.

Traces progress in understanding of plastic flow as a major problem for the structural designer and the physicist alike. Includes fractographs showing typical structural patterns of different metals resulting from plastic flow. (Q23)

126-Q. Elastic Properties. W. Köster. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 55-63.

Influence of temperature, concentration, mechanical and thermal treatment, and ferromagnetic state on modulus of elasticity. Measurements on monocrystals and determination of modulus of elasticity. 26 ref. (Q21)

127-Q. Materials Testing. E. Siebel, N. Ludwig, H. Nowotny, O. Vaupel, and H. Schallbroch. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 232-344.

Strength characteristics of metals in testing and construction, methods and equipment for strength analysis, wear due to cavitation, nondestructive testing of materials, and cutting and machining tests. 603 ref. (Q general, S13, G17)

128-Q. Utilization of Low Alloy Materials for High Temperature Service Applications. James Miller, L. W. Smith, and Phillip K. Porter. *U. S. Air Force, Air Material Command, Wright-Patterson Air Force Base*, Technical Report 5929, June 1949, 59 pages.

Reports on project to evaluate the high-temperature load-carrying abilities of low-alloy and stainless steels and to determine the feasibility of their use for applications involving exposure to high temperatures for relatively short periods of time. Effect of heat treatment on high-temperature properties was studied for improving short-time strengths. (Q general, AY, SS, SG-h)

129-Q. Static and Fatigue Strengths of High-Strength Aluminum-Alloy Bolted Joints. E. C. Hartmann, Marshall Holt, and I. D. Eaton. *National Advisory Committee for Aeronautics*, Technical Note 2276, Feb. 1951, 61 pages.

Tests were made on several types of joints in 75S-T6, 24S-T4, and 14S-T6 high-strength Al-alloy extruded bar. In order to evaluate sensitivity to effects of a notch consisting of two open holes, a monobloc specimen was tested under a mean load of 16,000 lb. (Q27, Q7, Al)

130-Q. Bearing Strengths of Some Aluminum-Alloy Permanent-Mold Castings. E. M. Finley. *National Advisory Committee for Aeronautics*, Technical Note 2312, Feb. 1951, 15 pages.

Bearing tests were made to determine bearing ultimate and yield strengths of permanent-mold castings of B195-T4, B195-T6, and 356-T6, and to compare the ratios of bearing to tensile properties obtained from sand castings of like material. (Q27, Al)

131-Q. Minor Uses of the Light Metals. II. Titanium in Cast Iron. *Light Metals*, v. 14, Feb. 1951, p. 89-91.

Effects on mechanical properties and corrosion resistance. (Q general, R general, Ti, CI)

132-Q. Correspondence on the Paper: "Tessellated Stresses. Part V," by F. Laszlo. *Journal of the Iron and Steel Institute*, v. 167, Jan. 1951, p. 28-30.

M. L. V. Galer and E. Orowan briefly discuss above paper (Jan. 1950 issue; item 93-Q, 1950.). Dr. Laszlo replies at some length. (Q25, N7)

133-Q. Creep Properties of Some Aluminium Alloys at Temperatures up to 300° C. J. McKeown and R. D. S. Lushey. *Metallurgia*, v. 43, Jan. 1951, p. 15-19.

The materials tested included three wrought and seven cast alloys. Although there are appreciable differences at 100° C., as the temperature is raised, the differences in creep resistance decrease. The order of superiority is not the same throughout the entire temperature range. (Q3, Al)

134-Q. Cumulative Damage in Fatigue; Notes on Information Available From Literature. K. W. Mitchell. *Metallurgia*, v. 43, Jan. 1951, p. 25-28.

In normal fatigue testing, a particular form of load cycle, with simple or combined stresses, is repeated until the specimen breaks. There are, however, occasional applications of stress much higher than normal. While the effects of under-stressing and over-stressing have been investigated, there appears to be no generally accepted manner of formulating a laboratory test which will evaluate the ability of a material to withstand random fluctuations of stress. 16 ref. (Q7)

135-Q. Tensile Properties of Mild Steel Weld Metal at High Temperatures. J. G. Ball and K. Winterton. *Welding Research,* v. 4, Dec. 1950 (bound with *Transactions of the Institute of Welding,* v. 13, Dec. 1950), p. 104r-124r.

Apparatus used to determine tensile properties up to 1425° C. Between 900 and 1100° C., all the mild-steel weld metals tested were found to have low ductility compared with values at higher and lower temperatures. As loss of ductility was more pronounced in specimens cut transverse to the welding direction, and also as ductility could be improved by annealing, it is probable that the effect is due to segregation. Mild-steel weld metal tested at 1200-1425° C. was found to have high ductility. Includes percentage and composition of oxide inclusions in three samples, also electron-microscope examination of weld-metal structures. 11 ref. (Q27, M27, CN)

136-Q. Ductility of Mild Steel Welds Near the Solidus. E. C. Rollason. *Welding Research,* v. 4, Dec. 1950, (bound with *Transactions of the Institute of Welding,* v. 13, Dec. 1950), p. 125r-128r.

Results of some simple hot-tensile tests on core wire and weld metal show a lowering of ductility at 1250-1280° C. Welds graded according to this criterion are in correct order as regards hot-cracking during welding. Increase of Mn in one type of electrode was shown to maintain hot ductility to a higher temperature. (Q27, K1, CN)

137-Q. An Explanation of Hot-Cracking of Mild Steel Welds. E. C. Rollason. *Welding Research,* v. 4, Dec. 1950 (bound with *Transactions of the Institute of Welding,* v. 13, Dec. 1950), p. 129r-132r.

Explains the above on the basis of a major effect of S and Mn modified by minor influences of P, Si, C, and Ni. Includes macrographs. (Q26, K1, CN)

138-Q. Contribution to the Study of Creep in Boron Steels. (In French.) Georges Delbart and Michel Ravery. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 231, Dec. 18, 1950, p. 1498-1500.

Presence of a small amount of boron in steel causes, in certain cases, formation of precipitates on the grain boundaries despite the fact that boron causes an increase in grain size. Steels containing boron and manifesting grain-boundary precipitation have lower creep resistance in the range 450-550° C. than steels of the same composition except for the boron. (Q3, N7, AY)

139-Q. Distribution of Plastic Deformation in an Iron Tensile-Test Specimen Displaying the Piobert-Luders Phenomenon. (In French.) Michel Mouflard and Paul Lacombe. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 231, Dec. 18, 1950, p. 1500-1502.

Results of investigation of phenomena commonly known as "Luder's lines." (Q24, Fe)

140-Q. Influence of Microstructure and Chemical Composition on the Creep Strength of Chromium-Molybdenum Steels. (In French.) Georges Delbart and Michel Ravery. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 232, Jan. 3, 1951, p. 67-69.

Comparative investigation of three steels (0.12-0.53% C, 0.6-2.0% Cr, 0.44-0.60% Mo) at 450, 500, and 575° C. Results indicate that crystal structure of specimens of the same composition, dependent on testing temperature, often has more influence on creep strength than does composition. (Q3, M26, AY)

141-Q. Elements of the Internal Mechanics of Metals. (In French.) Paul Coron. *Bulletin du Cercle d'Etudes des Métaux,* v. 5, Mar. 1950, p. 285-312.

Theoretical analysis. Equations are developed to express some of the fundamental relationships which exist. They are interpreted for different values of the variables. (To be continued.) (Q25)

142-Q. Suggestion for Proper Evaluation of the Material and Operating Temperatures of Pipelines and Flanges. S. Schwaigerer. *Brennstoff-Wärme-Kraft,* v. 3, Jan. 1951, p. 12-13.

Brief discussion of steel composition, operating temperatures, and mechanical properties of steels, required for selection of proper pipeline materials and calculation of permissible pressures. (Q general)

143-Q. Possible Improvements in the Usual Photo-Elastic Stress Apparatus. (In Italian.) W. Ruff. *Alluminio,* v. 19, no. 6, 1950, p. 523-536.

Several improvements in the Winkler-Zeiss instrument. Comparative results. 18 ref. (Q25)

144-Q. Specific Resistance of Metals to Repeated (Noncontact) Compression. (In Russian.) E. A. Chudakov and G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the U.S.S.R.), new ser., v. 76, Jan. 1, 1951, p. 37-40.

Proves experimentally that, for machine parts subjected to repeated tensile and compressive stresses, the optimum part shape is not the most symmetrical one. In medium-carbon (0.45%) steel, for example, fatigue strength under compression is much higher than under tension. Apparatus and procedure. Data for plain and notched specimens. (Q28, CN)

145-Q. Low-Cost Hardness Tester is Rugged. *Iron Age,* v. 167, Mar. 15, 1951, p. 116.

Simple apparatus developed by F. W. Sowa and W. C. Truckenmiller, University of Michigan, satisfactorily meets the six requirements without the obvious limitations of the "file test." It is based on the principle of elastic rebound. (Q29)

146-Q. Further Developments in the Burning of Boiler Fuels in Marine Diesel Engines. John Lamb. *Journal of the American Society of Naval Engineers,* v. 63, Feb. 1951, p. 201-251. (Reprinted from *Transactions of the Institute of Marine Engineers,* v. 60, June 1950).

Results obtained in service for various ships. Performance; engine design; wear and corrosion of parts; cylinder-liner and piston-ring materials; lubrication, purification of fuel required for satisfactory operation; and causes of carbon formation on fuel-valve nozzles. Use in 2-cycle engines and need for preheating of fuels. (Q9, R7, CI, ST)

147-Q. Direct Explosion Test to Evaluate Load-Carrying Capacity of Welded Steel Structures. G. S. Mikhalapov. *ASTM Bulletin,* Feb. 1951, p. 53-64.

Test consists essentially in applying a high-velocity blow normal to, and at the center of, a flat, square plate supported along its four edges. Typical results. (Q6, CN)

148-Q. A Mechanical Wear Test Using Fission Fragments. David H. Frisch and Jules S. Levin. *ASTM Bulletin,* Feb. 1951, p. 64-65.

A "hot patch" of surface radioactivity is applied locally to a surface by placing an enriched fission foil near the surface and irradiating the fissionable material with neutrons from a source surrounded by a moderator such as paraffin, water, or oil. The method is adapted to measuring wear depths of from a few millionths to a few ten-thousandths of an inch of dense materials, and up to a mil of lighter materials such as plastics. (Q9, S19)

149-Q. Fatigue Tests of Beams in Flexure. *Welding Journal,* v. 30, Mar. 1951, p. 105s-115s.

Results of fatigue tests on various types of steel beams similar to those used in actual structures and subjected to repeated load cycles. The tests were conducted by W. M. Wilson of the University of Illinois. (Q7, CN)

150-Q. Higher Design Stresses for Pressure Vessels. Perry R. Cassidy. *Welding Journal,* v. 30, Mar. 1951, p. 123s-124s.

Effect of stress concentration in alloy steel pressure vessels under conditions of multiaxial stress and for numbers of cycles of stress less than 100,000. (Q25, T26, AY)

151-Q. Stress Distribution in Plastic Range in a Rigid Frame. L. E. Grinter, Charles Peller, and John Butkus. *Welding Journal,* v. 30, Mar. 1951, p. 125s-134s.

Action of a continuous frame welded for full strength of the material under the influence of a few repeated loads carried well beyond the elastic limit. (Q25)

152-Q. Stress Relieving and Fracture Strength. D. Swan, A. R. Lytle, and C. R. McKinsey. *Welding Journal,* v. 30, Mar. 1951, p. 135s-145s.

Factors of straining and heating involved in application of the controlled low-temperature stress-relieving process were investigated by studying their effect on transition temperature of A-201 steel. It was concluded that there is no appreciable metallurgical effect accompanying this process. Amount of plastic deformation occurring during a destructive test, as measured by amount of strain hardening which takes place at initiation of fracture, was shown to be dependent upon severity of testing conditions. (Q25, J1, CN)

153-Q. Spherical Shells Subjected to Internal Pressure and Low Temperatures. J. L. Walmsley. *Welding Journal,* v. 30, Mar. 1951, p. 153s-167s.

Spherical shell tests were designed to study the behavior of a typical pressure-vessel steel under conditions of biaxial tensile stress combined with subnormal temperatures. Includes thoeretical, mathematical analysis of the results. 13 ref. (Q27, T26, CN)

154-Q. The Micro-Mechanism of Fracture in the Tension Impact Test. *Welding Journal,* v. 30, Mar. 1951, p. 168s.

W. B. Brooks discusses above paper by W. H. Bruckner (Sept. 1950 issue; item 649-Q, 1950). Includes author's reply. (Q27, ST, Fe)

155-Q. Impact Tests Help Engineers Specify Steel. *SAE Journal,* v. 59, Mar. 1951, p. 24-28. (Based on papers given at a meeting of the SAE Iron and Steel Technical Committee's Div. XXIV, on "Low-Temperature Properties of Ferrous Materials," by L. D. Jaffe, P. R. Kosting, A. F. Jones, J. I. Bluhm, A. Hurlich, and J. F. Wallace).

Method developed at Watertown Arsenal laboratory whereby the notched-bar impact test may be used quantitatively for specification of steel for service under shock loading or at low temperatures. Use is made of the concept of an "equivalent Charpy temperature," which is the temperature at which a V-notched Charpy impact-test specimen has fracture behavior similar to that of a given part loaded in its usual service fashion at the lowest anticipated service temperature. (Q6, ST)

156-Q. Fatigue Failures Are Tensile Failures. J. O. Almen. *Product Engineering,* v. 22, Mar. 1951, p. 101-124.

Case histories in which unexpected and unrecognized improvement in

fatigue strength of metal products was obtained from processes applied for other purposes. Re-interpretation of old test data in terms of residual stresses indicates that superior fatigue strength can result from fracture barriers established by beneficial residual stresses induced by fabrication operations or produced by prestressing processes. 17 ref. (Q7, Q25)

157-Q. Mechanical Properties of Metals. H. W. Gillett. *Machine Design*, v. 23, Mar. 1951, p. 143-148, 198, 200. (Based on a chapter of forthcoming book "The Behavior of Engineering Metals.")

How properties are measured and their significance. Emphasizes deviations often encountered between test results and service behavior. (Q general)

158-Q. Fractographic Pattern for 475° C. Embrittlement in Stainless Steel. Carl A. Zapffe. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 247-248.

Three fractographs illustrate the patterns produced by rifle fire at 100 and 475° C., in Type 446 stainless steel. Transgranular fracture typical of both embrittled and non-embrittled metal is observed below 475° C. Above this temperature, slip begins to play a part. Possible mechanisms. (Q23, M27, SS)

159-Q. Deformation and Recrystallization Texture of Cold-Drawn OFHC Copper Wire. W. A. Backofen. *Journal of Metals*, v. 3, Mar. 1951; *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 191, 1951, p. 250.

Illustrated by X-ray photograms. (Q24, Cu)

160-Q. Mercury Switch Permits Use of Unlimited Number of Electric Strain Gages. Stuart R. Daniels and U. Seiden. *Civil Engineering*, v. 21, Mar. 1951, p. 48. (Q25)

161-Q. Tensile-Fracturing Characteristics of Several High-Temperature Alloys as Influenced by Orientation in Respect to Forging Direction. W. F. Brown, Jr., H. Schwartzbart, and M. H. Jones. *National Advisory Committee for Aeronautics*, Research Memorandum E50L28, Feb. 12, 1951, 32 pages.

Effects of specimen-axis orientation with respect to forging direction on the true stress-strain curves and the fracturing characteristics at room temperature of forged and subsequently heat treated billets of the alloys 16-25-6, S-816, and Inconel X. 13 ref. (Q27, Q24, SG-h)

162-Q. Some Properties of Beryllium Oxide and Beryllium Oxide-Columbium Ceramals. C. F. Robards and J. J. Gangler. *National Advisory Committee for Aeronautics*, Research Memorandum E50G21, Mar. 2, 1951, 18 pages.

Short-time tensile strength at 1800° F. and relative thermal shock resistance from 1800 and 2000° F. to room temperature were investigated. Effect of additions of 2, 5, 8, 10, 12, and 15% Cb by weight on the thermal shock resistance of BeO. Metallographic examination indicated that the metallic phase coalesces into pockets. Includes graphs, micrographs, and X-ray diffraction patterns. (Q27, M27)

163-Q. Static Indentation Hardness With Indenters Indicating Direction. H. Meincke. *Industrial Diamond Review*, new ser., v. 11, Feb. 1951, p. 37-41; disc. p. 41-42.

Tensile-strength tests give different values according to the direction of rolling, drawing, or pressing, whereas some hardness testing methods give values independent of direction. With indenters indicating direction, i.e. edges or chisels, hardness values in conformity with tensile strength were obtained. (Q29)

164-Q. A Calculation of the Elastic Constants of Aluminum. R. S. Leigh. *Philosophical Magazine*, ser. 7, v. 42, Feb. 1951, p. 139-155.

Elastic constants, which correspond to pure shear without change of volume, are calculated; and the fact that Al crystals are almost elastically isotropic is explained. Nature of the density of states near the Fermi surface, and the way in which the elastic constants may be expected to depend on electron concentration in Al solid solutions. (Q21, P10, Al)

165-Q. Effect of Internal Stresses on the Behavior of Members in the Plastic Range. J. F. Baker and M. R. Horne. *Engineering*, v. 171, Feb. 23, 1951, p. 212-213.

Results of experimental investigation and theoretical analysis. Includes graphs and diagrams showing behavior of steel beams. (Q25, CN)

166-Q. A Survey of the Development of Creep-Resisting Alloys. N. P. Allen. *Engineering*, v. 171, Feb. 23, 1951, p. 235-238. (A condensation.)

Includes tables giving compositions of several creep resisting alloys developed in Britain, the U. S., and Germany. (Q3, SG-h)

167-Q. The Development of Low-Carbon N-155 Alloy for Gas-Turbine Construction. W. O. Binder. *Journal of the Iron and Steel Institute*, v. 167, Feb. 1951, p. 121-134.

Early development of the alloy, and the influence of hot cold working, solution annealing, and precipitation hardening on structure, room-temperature strength, ductility, and impact resistance. Properties at elevated temperatures, and creep curves for various stresses at 650, 730, and 815° C. Amount of scatter in stress-rupture test results is investigated and statistically examined. 29 ref. (Q3, Q4, J27, T25, SG-h)

168-Q. Some Phenomena Associated With the Work-Hardening and Tempering of Steels. P. E. Brookes. *Metal Treatment and Drop Forging*, v. 18, Feb. 1951, p. 75-85.

X-ray back-reflection techniques were used to investigate residual stresses in cold drawn steels. The stresses are shown to vary with carbon content. Effect of tampering on such stresses and suggestions to explain the phenomena observed. 13 ref. (Q25, J29, ST)

169-Q. Some Factors Affecting Microhardness Values. B. B. Hundy. *Metallurgia*, v. 43, Feb. 1951, p. 99-102.

Correlates work of Bergsman and of Bischof and Wenderott with that of the author. (Q29)

170-Q. The Tensile Properties of Heat-Treated Aluminium-Copper and Aluminium-Copper-Cadmium Alloys of Commercial Purity. H. K. Hardy. *Journal of the Institute of Metals*, v. 78, Feb. 1951, p. 657-666.

Al-Cu-Cd alloys of normal purity were examined in the cast or wrought condition. Alloys with more than 0.1% Cd were hot short and generally failed to forge. The quantity of Cd was not critical in the case of cast alloys, and up to 0.5% had no detrimental effect on the ductility of fully heat treated test bars at room temperature. Cd additions increased the strength properties of artificially aged Al-Cu alloys, and slightly improved resistance to salt-spray corrosion. The effect of Cd was not influenced by the presence of Fe, Si, Mn, Zn, Ni, or 0.05% Mg. (Q27, R11, Al)

171-Q. The Fatigue Strength of Metallic Materials Under Alternating Stresses of Varying Amplitude. (In English.) Toshio Nishihara and Toshiro Yamada. *Japan Science Review*, v. 1, Sept. 1950, p. 1-6.

Theoretical calculation of the number of stress cycles required to produce failure. Three fatigue-testing machines and their use to test mild steel, "hard steel", and duralumin. Good agreement with theory was obtained. (Q7, CN, ST, Al)

172-Q. A New Theory Concerning the Yielding of Materials Based on Riemannian Geometry. (In English.) Kazuo Kondo. *Japan Science Review*, v. 1, Sept. 1950, p. 7-10. (Q23)

173-Q. Research on the Plasticity in Chain Links. (In English.) Kazuo Hamano. *Japan Science Review*, v. 1, Sept. 1950, p. 17-22.

Results of experiments on cast steel stud chain links, using both tensile-test bars and chain-link sets of different sizes, also six cast steel compositions and 3 heat treatments. 10 ref. (Q23, T7, CN)

174-Q. (Book) **Statistics and Strength of Materials.** Jasper O. Draffin and W. Leighton Collins. 398 pages. Ronald Press Co., 15 E. 26th St., New York. $6.50.

An elementary text. The strength-of-materials portion covers simple structural elements involving direct stress, welded connections, torsion, bending, and column action. Data are presented for the more modern materials, such as light-weight alloys, high-strength steel, and plastics. Resistance of materials to energy, creep, repeated loading, and stress concentrations is covered briefly. General principles and their application are stressed. (Q general)

R

CORROSION

89-R. Corrosion of Bubble Caps in a Chemical Plant. Clyde W. Day, R. C. Schueler, and E. V. Kunkel. *Corrosion* (News Section), v. 7, Feb. 1951, p. 1.

Corrosion of Types 316 and 317 stainless steel upon exposure to various concentrations of acetic acid at 200-300° F. (R5, SS)

90-R. Ohio River Division Corrosion Problems. J. A. Davenport. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 42-46; disc., p. 46.

Organization and duties of the Ohio River Div., Corps of Engineers, U. S. Army. Locations of tests conducted in recent years as well as corrosion studies under way and contemplated. Cooperative studies and tests on stainless steels, low-alloy steels, carbon steels, and aluminum. Results of different types of painting tests. Surface preparation necessary before application of the coatings and corrosion caused by atmospheric exposure. (R4, R3, ST, Al)

91-R. Summary and Conclusions: Report of Protective Coatings Investigation Underwater Exposure Tests, 1941-1949. H. W. Mundt, L. J. Thompson, and S. J. Stacy. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 50.

Results of inspections and observations of the performance of selected protective-coating systems in submerged fresh-water exposure on the Isthmus of Panama covering a period of approximately 8 years. Zinc metallization is recommended. (R4, L23, ST, Zn)

92-R. Summary and Conclusions: Report of Metals Corrosion Investigation, Immersion Tests Five Years Duration, Initiated 1941. H. W. Mundt, L. J. Thompson, and S. J. Stacy. *Cor-*

rosion (Technical Section), v. 7, Feb. 1951, p. 51.

Conclusions from report on immersion of a selected group of welded and bare uncoupled ferrous and nonferrous metals in Canal Zone fresh, brackish, and sea waters. (R4)

93-R. Studies on Galvanic Couples: I. Measurement of Electromotive Force and Internal Resistance of Cells During Current Flow. II. Some Potential-Current Relations in Galvanic Corrosion. III. Polarization and Cathodic Protection. H. D. Holler. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 52-68.

Part I: method of measuring effective emf. and internal resistance of a galvanic cell during current flow. A dry cell was used for demonstration of the method. Part II: a graphic method of expressing electrical characteristics of a galvanic couple is developed by application of Kirchoff's laws to a couple consisting of separate electrodes, each with an ammeter in series. Relations were demonstrated with the iron-magnetite couple. Part III: the mechanism of polarization of a galvanic couple. The roles of electrode potentials and of resistive-potential differences are demonstrated in polarization and cathodic protection. Several methods of showing the relation between polarizing current and galvanic-couple potential. 11 ref. (R1, R10)

94-R. Discussions. *Corrosion* (Technical Section), v. 7, Feb. 1951, p. 69-70.

E. C. Reichard of American Smelting and Refining Co. and Oliver Osborn of Dow Chemical Co. discuss separately "the Use of Cathodic Protection in Conjunction With Paint Coatings—A Progress Report," by W. L. Crosby (Nov. 1950 issue, item 444-R, 1950). (R10, R4, ST)

95-R. Corrosion in Amine Gas Treating Plants. F. C. Riesenfeld and C. L. Hughes. *Petroleum Refiner*, v. 30, Feb. 1951, p. 97-106.

Previously abstracted from *American Society of Mechanical Engineers*, Paper 50-Pet-16, 1950. See item 42-R, 1951. (R9, R5, Al, Ni, AY, CN, SS)

96-R. Practical and Relative Simple Corrosion Tests Found Effective. F. L. La Que. *Petroleum Refiner*, v. 30, Feb. 1951, p. 120-122.

Simple setups for installing corrosion specimens within process equipment. (R11)

97-R. New Inhibitor for Sulfide Corrosion. J. A. Caldwell. *Oil and Gas Journal*, v. 49, Feb. 8, 1951, p. 95, 97.

Work of Humble Oil Co. with an inhibitor known as "Corexit" (composition not indicated). Results, which are charted, have been very encouraging. (R10, R5, ST)

98-R. Corrosion and Field Lining of Sulphate Digesters. T. T. Collins, Jr., S. J. Baisch, and G. T. Vander Velden. *Paper Trade Journal*, v. 132, Feb. 9, 1951, p. 24, 26-27; Feb. 16, 1951, p. 18, 20, 22, 24, 26.

Experiences of Thilmany Pulp & Paper Co., Kaukauna, Wis. 62 ref. (R5, T29, ST)

99-R. Electrolytic Corrosion of Metals. A. E. Durkin. *General Electric Review*, v. 54, Feb. 1951, p. 45-48.

Importance as a design factor in selection of materials. The electromotive series provides a guide in choosing materials that will not give rise to electrolytic corrosion; but it must be supplemented by knowledge of conditions which may introduce exceptions. 12 ref. (R1)

100-R. From a Metallurgist's Notebook: Corroded Brass Fasteners. H. H. Symonds. *Metal Industry*, v. 78, Feb. 2, 1951, p. 86-87.

Spectrographic examination, solubility tests, chemical tests, and corrosion tests were among the methods used to discover the cause of corrosion on brass wallet fasteners. Conclusions indicated that the corrosion was due to the high fatty acid content of the grease in the leather. (R7, Cu)

101-R. Chromic Acid. *Chemical Engineering*, v. 58, Feb. 1951, p. 147, 243-244, 246-248.

Series of short articles on how various materials of construction stand up to chromic acid: "High-Silicon Irons," Walter A. Luce; "Coatings," Kenneth Tator; "Iron and Steel," Albert W. Spitz; "Stainless," Grant L. Snair; "Glass Lining," S. W. McCann; "Rubber Lining," James P. McNamee; "Tantalum," Leonard R. Scribner; "Nickel & Alloys," W. Z. Friend; "Carbon," W. M. Gaylord; "Lead," Kempton H. Roll; "Chemical Stoneware," F. E. Herstein; "Durimet 20," Walter A. Luce; "Chlorimets," Walter A. Luce; "Aluminum," A. B. McKee and A. Fitz; "Wood," Henry B. Smith, III; "Silicones," J. A. McHard and Leon Van Volkinburg; and "Worthite," W. E. Pratt. (R5, SG-g)

102-R. Fatigue Testing and Development of Drill Pipe-to-Tool Joint Connections. William S. Bachman. *Petroleum Engineer*, v. 23, Feb. 1951, p. B36, B38, B40, B42, B44, B46, B48, B50-B51.

See abstract of "Drill Pipes and Tool Joints Undergo Rigid Tests for Fatigue," *Drilling*, item 11-R, 1951. (R1, Q7, AY)

103-R. Joint Cathodic Protection Systems. *Petroleum Engineer*, v. 23, Feb. 1951, p. D53-D55.

Techniques of design and installation; possible division of responsibilities for construction, operation, and maintenance; and sharing of costs. (R10)

104-R. Interchangeability of Cb and Ta in Type 347 Stainless. W. O. Binder. *Metal Progress*, v. 59, Feb. 1951, p. 219-227.

Studies were made on 18-8 steels containing 0.035-0.07% C using tantalum metal, the ferrocolumbium alloy containing approximately 55% Cb and 5-7% Ta, and a new ferroalloy containing about 40% Cb and 20% Ta. Object was to determine the equivalency of Ta with respect to Cb in preventing intergranular attack, the probable ratio of Cb+Ta to carbon required for practical immunity to intergranular attack, and the effect of a partial substitution of Ta for Cb on the strength and ductility of normal Cb-bearing 18-8 steel at room and elevated temperatures. Results indicate that on an equal-weight basis, Ta is as effective as Cb for promoting high-temperature strength. (R2, SS)

105-R. White Rust on Zinc. *Metal Progress*, v. 59, Feb. 1951, p. 264, 266. Condensed from "White Rust Formation on Zinc," P. T. Gilbert and S. E. Hadden.

Previously abstracted from *Journal of the Institute of Metals*. See item 87-R, 1951. (R3, Zn)

106-R. Corrosion of Marine Condenser Systems. *Metal Progress*, v. 59, Feb. 1951, p. 273-274, 276, 278. Condensed from "Corrosion and Related Problems in Sea Water Cooling and Pipe Systems in the H. M. Ships", I. G. Slater, L. Kenworthy, and R. May.

Previously abstracted from *Journal of the Institute of Metals*. See item 303-R, 1950. (R4, Cu)

107-R. Substituted Amines as Inhibitors in the Acid Corrosion of Steel. Lloyd E. Swearingen and Alfred F. Schram. *Journal of Physical and Colloid Chemistry*, v. 55, Feb. 1951, p. 180-187.

Inhibiting action of ethylamine and of four of its substituted derivatives in the corrosion of steel cathodes by 1.0 *N* H_2SO_4 was investigated. The substituted derivatives were all better inhibitors than the parent substance. The increased inhibiting effect obtained with the derivatives is not due to size or shape of the molecules, but can be explained on the basis of those factors that are altered in such manner as to enhance adsorbability. 20 ref. (R10, ST)

108-R. By the Sea, By the Beautiful Sea. *Chemical and Engineering News*, v. 29, Feb. 26, 1951, p. 798-799.

Picture story of International Nickel Co.'s corrosion-testing station near Wilmington, N. C. (R11)

109-R. Fatigue Tests of Rail Webs. R. S. Jensen. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 680-690.

Part of "Report on Assignment 11: Recent Developments Affecting Rail Section," from Report of Committee 4 on Rail. Results of laboratory corrosion-fatigue tests in tap water. (R1, T23, CN)

110-R. Molybdate and Tungstate as Corrosion Inhibitors and the Mechanism of Inhibition. W. D. Robertson. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 94-100.

A comparative study of corrosion inhibition of iron by molybdate, tungstate, chromate, and nitrite. Both molybdate and tungstate are efficient inhibitors and comparable to chromate and nitrite; unlike chromate and nitrite, they do not oxidize ferrous ion and, consequently, the primary mechanism of inhibition probably does not involve coprecipitation of oxidation and reduction products of the metal and inhibitor ion to form a protective oxide film. Therefore, passivating inhibitors need not be oxidizing agents. Inhibition appears to be associated with adsorption at the metal-solution interface. (R10, Fe)

111-R. Potential-pH Diagram of Zinc and Its Applications to the Study of Zinc Corrosion. Paul Delahay, Marcel Pourbaix, and Pierre Van Rysselberghe. *Journal of the Electrochemical Society*, v. 98, Mar. 1951, p. 101-105.

The diagram was constructed on the basis of methods and conventions previously described and using available thermodynamic and electrochemical data. Derived diagrams also show domains of corrosion, passivity, and passivation in the absence and presence of CO_2, bicarbonates, and carbonates. 11 ref. (R1, Zn)

112-R. Relationship of Fly Ash and Corrosion. Joseph P. Ryan. *Journal of the American Concrete Institute*, v. 22, Feb. 1951; *Proceedings*, v. 47, 1951, p. 481-484.

Possible corrosion of steel reinforcing rods for concrete by fly ash contained in the concrete. Work of Chicago Sanitary District and other investigators on the problem. Conclusions indicate that corrosion effects are minor if fly-ash content is kept under 3%. (R7)

113-R. X-Ray Diffraction Study of the Oxidation Characteristics of Nickel Pickled Sheet Iron as Related to Enamel Adherence. Gordon S. Douglas and Jason M. Zander. *Better Enameling*, v. 22, Feb. 1951, p. 8-12, 14-15, 22-23, 27-28.

Previously abstracted from *Journal of the American Ceramic Society*. See item 53-R, 1951. (R2, L28, CN)

114-R. Pipe-to-Soil Potentials as an Indication of Corrosion. *Oil and Gas Journal*, v. 49, Mar. 1, 1951, p. 65-66.

Technique. (R11)

115-R. Corrosion Mitigation in the North McCallum Field. C. C. Frye, W. L. Giezentanner, and Fred M. Clement. *World Oil*, v. 132, Mar. 1951, p. 138-140, 142.

Severe corrosion of tubing and casing in distillate field production led to a series of operating tests in which various inhibitors were used, with and without plastic-coated tubing. Results and illustrations showing severity of attack. (R10, ST)

116-R. A Corrosion Control Program. L. A. Kellogg. *Gas Age*, v. 107, Mar. 1, 1951, p. 11-13.

Program applied to a recently laid natural gas transmission line near Syracuse, N. Y. (R10, CN)

117-R. Cathodic Protection Measures Stop Cable Sheath Corrosion Failure. W. T. Rose. *Electrical World*. v. 135, Feb. 26, 1951, p. 84-88.

Jacketed cables; rectifiers connected through old cables to force current flow to cable sheaths; tieing of cable sheaths, telephone cable, and multigrounded neutrals to water pipes all contributed to solution of problem. (R10, T1, Pb)

118-R. Corrosion Testing at Sea Horse Institute. W. A. Raymond. *Organic Finishing*, v. 12, Feb. 1951, p. 9-11, 23.

Facilities at new site which replaces the Kure Beach site, formerly used by International Nickel Co. for marine corrosion and fouling tests. (R11)

119-R. Corrosion Problems in the Modern By-Product Coke Plant. C. F. Pogacar and E. A. Tice. *Corrosion* (Technical Section), v. 7, Mar. 1951, p. 76-84; disc., p. 84.

Results of corrosion tests in the various processing steps, and uses of corrosion resistant alloys in some of the newer units. Data were collected through use of spool corrosion tests in plant equipment under conditions of normal plant operation. The materials of construction for equipment, beginning with the evolution of gas in the ovens and ending with its storage in gas holders. (R7, T5, SG-g)

120-R. A New Instrument For Measuring Galvanic Corrosion Currents. H. P. Godard. *Corrosion* (Technical Section), v. 7, Mar. 1951, p. 93-97.

The theory of galvanic corrosion is reviewed briefly. An apparatus for measuring magnitude of a galvanic corrosion current, its theory of application and procedure. Practical application in measuring the protection given to the core of an aluminum alloy by the less noble cladding material. (R11)

121-R. Thermofor Catalytic Cracking Gas Plant Corrosion Survey. Christopher A. Murray. *Corrosion* (Technical Section), v. 7, Mar. 1951, p. 98-108.

Severe corrosion experienced by this plant and representative inspection findings. A complete chemical survey of gas-plant streams for amount and type of corrosives, together with water present. NH_3 and H_2S are the principal corrosives present. (R9)

122-R. Discussions. *Corrosion* (Technical Section), v. 7, Mar. 1951, p. 109-112.

Covers "Aerobic Microbiological Corrosion of Water Pipes", by Erik Olsen and Waclaw Szybalski (Dec. 1950 issue; item 482-R, 1950), and "The Influence of Stress on Corrosion", Julius J. Harwood (Aug. and Sept. 1950 issues; items 296-R and 334-R, 1950). Includes authors' replies. (R1, Fe)

123-R. Corrosion. R. Ergang, G. Masing, G. Wassermann, and W. Wiederholt. "The American FIAT Review of German Science. Vol. 31. General Metallurgy," 1950, p. 345-380.

A general review covering theory of corrosion, stress-corrosion, and corrosion test methods. 169 ref. (R1, R11)

124-R. Role of Dissolved Oxygen During the Inhibition of the Corrosion of Iron by Sodium Phosphate Solutions. *Nature*, v. 167, Jan. 27, 1951, p. 157.

Investigation undertaken to determine the effect of dissolved oxygen on the corrosion rate of iron totally immersed in solutions of sodium phosphate at different pH values. (R10, Fe)

125-R. Aircraft Metallic Materials Under Low Temperature Conditions. P. L. Teed. *Journal of the Royal Aeronautical Society*, Feb. 1951, p. 61-81; disc., p. 81-86.

Chemical aspects (corrosion and wear), physical consequences of low temperatures, and engineering significance of low-temperature effects. Data for commercial ferrous and nonferrous metals. Includes information on low-temperature transformations. 20 ref.
(R general, Q9, N general)

126-R. Tensile Failure of Carbon and Stainless Steel Wires in the Presence of Water and Hydrogen Sulphide. J. E. Truman. *Metallurgia*, v. 43, Jan. 1951, p. 8-10.

Premature failure of both ordinary and corrosion resisting steels, in conditions of service involving presence of H_2S, were investigated. A combination of tap water and H_2S at room temperature can cause considerable reduction in life of steel specimens stressed to 40% of their maximum stress, although a Cr-Ni-Mo stainless steel showed no visible attack up to 10,800 hr.
(R5, Q27, CN, SS)

127-R. From a Metallurgist's Notebook: Tarnished Tableware. H. H. Symonds. *Metal Industry*, v. 78, Feb. 9, 1951, p. 113.

Dark brown and blue spots on the bowls of silver-plated spoons were investigated. It was found that they were caused by a corrosive atmosphere penetrating through minute pinholes in the paper with which the spoons were wrapped. (R3, Ag)

128-R. The Blistering of Paint Films. Part II. Blistering in the Presence of Corrosion. J. E. O. Mayne. *Journal of the Oil & Colour Chemists' Association*, v. 366, Dec. 1950, p. 538-547.

An examination was made of the contents of blisters in a film of plasticized polystyrene applied to steel and immersed in seawater. The blisters contained liquid but no gas. Movement of water through membranes of polystyrene was examined under both concentration and potential gradients. It was concluded that the blisters grow mainly by electro-endosmosis, although 4% or more of the contents may be due to hydration or ions, and osmosis may account for a further 6%. 13 ref.
(R2, R4, L26, ST)

129-R. Corrosion Resistance of Alloy Steels Toward Pure and Sulfur-Containing Carbon Monoxide. (In German.) O. Sunden and E. Böhm. *Chemie-Ingenieur-Technik*, v. 23, Jan. 14, 1951, p. 3-4.

Experiments show that only very highly allowed Cr-Ni steels are corrosion resistant when exposed to S-containing CO. (R9, SS)

130-R. Theory of Atmospheric Corrosion of Metals. (In Russian.) N. D. Tomashov. *Uspekhi Khimii* (Progress in Chemistry), v. 19, Nov.-Dec., 1950, p. 716-729.

Reviews the literature on 3 types of atmospheric corrosion (moist, wet, and dry). The relation between oxygen and hydrogen depolarization, role of cathodic inclusions in alloys, protective properties of corrosion products, and means of developing protection against atmospheric corrosion. 12 ref. (R3)

131-R. Metal Parts Corrosion-Proofed in Vapor Envelopes. *Steel*, v. 128, Mar. 12, 1951, p. 100, 103.

Cost of applying and later of removing heavy rust-preventive coatings, sludging, and oil spray on metal parts is eliminated by a packaging method which envelopes parts with a volatile corrosion inhibitor. Applied as a coating to kraft papers, the chemical slowly vaporizes, permeating the air surrounding the metal surfaces and forming an invisible protective film. This film prevents corrosion of parts wrapped in the paper or arrests rust if oxidation has started. Base chemical compound used is dicyclohexylammonium nitrite. (R10)

132-R. Corrosion Resistance of Anodized and Unanodized Titanium; Effect of Common Mineral Acid Solutions. Chuk-Ching Ma and Ernest M. Peres, Jr. *Industrial and Engineering Chemistry*, v. 43, Mar. 1951, p. 675-679.

Corrosion rates were determined by alternate-immersion corrosion testing at 35° C. Behavior of anodized and unanodized metals in selected acid solutions at their boiling points was investigated by total-immersion corrosion testing with aeration. Protective films formed under various conditions were evaluated. Corrosion resistance to Ti was found to depend more upon the oxidizing, reducing, or "neutral" tendencies of the corrosive medium than upon concentration of the medium. 12 ref. (R5, Ti)

133-R. Kinetics and Mechanism of Solid Phase Reactions in Oxide Films on Pure Iron. Earl A. Gulbransen and Roswell Ruke. *Industrial and Engineering Chemistry*, v. 43, Mar. 1951, p. 697-703.

See abstract of "Kinetics of Solid Phase Reactions in Oxide Films on Iron; The Reversible Transformation at or Near 570° C.," *Journal of Metals;* item 472-R, 1950.
(R2, N1, Fe)

134-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 43, Mar. 1951, p. 71A-72A, 74A.

Corrosion resistance of cast iron and its use in varied applications where this property is desired.
(R general, CI)

135-R. A New Inhibitor for Sulfide Corrosion. J. A. Caldwell. *Petroleum Engineer*, v. 23, Mar. 1951, p. B58, B61-B62.

Use of "Corexit," a non-toxic, free-flowing liquid developed by Humble Oil & Refining Co. (R10, ST)

136-R. The Distinguishing Characteristics of Water-Formed Deposits. Frank E. Clarke. *Journal of the American Society of Naval Engineers*, v. 63, Feb. 1951, p. 153-160.

Water-formed deposits can be logically classified as scales, sludges, corrosion products, high temperature oxides and biological deposits, depending on their methods of formation. Unfortunately there is a decided lack of consistency in use of these terms. Fundamental characteristics of deposits in accordance with definitions of the ASTM.
(R2, R4, ST)

137-R. Oxidation Kinetics of Nickel and Cobalt. Walter J. Moore and James K. Lee. *Journal of Chemical Physics*, v. 19, Feb. 1951, p. 255.

Results of a study of the oxidations at temperatures high enough that the parabolic rate law is followed, and at pressures high enough that rate constants are virtually independent of pressure. (R2, Ni, Co)

138-R. A Survey of Difficulties Encountered in Burning Heavy Residual Fuel Oils. E. F. Tibbetts, O. L. Wood, Jr., D. Douglas, and V. F. Estcourt. *American Society of Mechanical Engineers*, Paper 50-A-136, 1950, 54 pages.

Results of a letter survey of the petroleum and chemical industries and to a partial extent the power industry. Analyses of oil ashes and ash deposits are tabulated. Effect

of the vanadium content of the oil. Effect of various oils on carbon, alloy, and stainless steels and Ni alloys. 11 ref.
(R7, AY, CN, SS, Ni)

139-R. Exposure Tests of Galvanized-Steel-Stitched Aluminum Alloys. Fred M. Reinhart. *National Advisory Committee for Aeronautics,* Technical Note 2299, Feb. 1951, 23 pages.

Sheets of 24S-T3 and Alclad 24S-T3 joined to themselves by stitching with galvanized high-carbon steel wire were exposed in a marine atmosphere and in the tidewater to determine service life. Includes micrographs of results.
(R3, R4, Al, CN)

140-R. Natural Gas in Ohio: A History. T. H. Kerr. *Engineering Experiment Station, Ohio State University,* Circular 52, Sept. 1950, 116 pages.

History of five Ohio gas companies, gas measuring devices, regulation, storage, pipe, and underground corrosion of cast iron, wrought iron, and steel pipe in different Ohio soils.
(R8, CI, Fe, ST)

141-R. From a Metallurgist's Note-Book: Corroded Aluminium Foil. H. H. Symonds. *Metal Industry,* v. 78, Feb. 23, 1951, p. 147-148.

Isolated irregular areas of corrosion were found in a roll of Al foil. Evidence obtained indicated that contamination of the rolling oil was responsible. (R7, Al)

142-R. From a Metallurgist's Note-Book: Faulty Copper Boiler. H. H. Symonds. *Metal Industry,* v. 78, Mar. 2, 1951, p. 167-168.

It was said that the copper from which a small boiler was constructed was faulty and therefore responsible for the boiler's subsequent failure. Results of investigation show that failure was due to reduction of thickness by chemical attack and by progressive oxidation by products of fuel combustion.
(R7, S21, Cu)

143-R. Stress-Corrosion of Magnesium Alloys. E. C. W. Perryman. *Journal of the Institute of Metals,* v. 78, Feb. 1951, p. 621-642.

Stress-corrosion of Mg + 5% Al alloy in distilled water and other solutions. Stress-corrosion tests were also carried out on other commercial Mg-base alloys and on high-purity Mg. Susceptibility to stress-corrosion failure of the various commercial alloys tested was consistent with their reported service behavior, the Mg-Mn and Mg-Zn-Zr alloys being more resistant than the Mg-Al alloys. All the alloys tested, and also high-purity Mg, suffered stress-corrosion cracking in 0.5% KHF solution. It is thought that cracking may be associated with minor impurities, e.g. iron, which are known to have a deleterious effect on ordinary corrosion resistance. 21 ref. (R1, Mg)

144-R. Cracking of Aluminum-Magnesium Alloys in Contact With Mercury. (In French.) Pierre A. Jacquet and A. R. Weill. *Revue de l'Aluminium,* v. 27, Dec. 1950, p. 442-451.

The mercury-salt test, frequently used to determine the tendency of Cu alloys to intergranular cracking, was investigated in connection with Al+7% Mg alloys exposed to sea water. Includes X-ray diagrams, photomicrographs, and tables. (To be continued.) (R11, Al)

145-R. An Experimental Contribution to Drop Corrosion. (In German.) F. Blaha. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 82, Feb. 15, 1951, p. 170-175.

Experiments made to investigate the differential aeration theory of ferrous corrosion caused by drops. The experiments were made with drops of different solutions between the poles of an electromagnet and "aerated" by different gases.
(R1, Fe)

146-R. The Effect of Dilute Sulfuric Acid on Magnetized Iron. (In German.) G. Wagner. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 82, Feb. 1951, p. 181-183.

Experiments showed that chemical action in the sense of Ehrenhaft's magnetolysis does not exist, since no oxygen was present in the hydrogen evolved. (R5, Fe)

S

INSPECTION AND CONTROL

84-S. A Noncontact Temperature Measuring Device. J. E. Field and S. D. German. *Journal of Applied Physics,* v. 22, Jan. 1951, p. 106-107.

Radiation-thermocouple device designed to measure, record, or control the surface temperatures of moving rolls, belts, or materials, in a relatively low temperature range. (S16)

85-S. How One Manufacturer Uses New Dy-Chek Inspection Method. Fred M. Burt. *Machine and Tool Blue Book,* v. 47, Mar. 1951, p. 94, 96, 98, 100, 102.

How Byron Jackson Co. is using the Dy-Chek method for inspecting bulky parts used in the manufacture of turbine and centrifugal pumps. (S13)

86-S. Multi-Channel Apparatus for Recording Temperatures. W. I. J. Price and J. J. Trott. *Journal of Scientific Instruments,* v. 28, Jan. 1951, p. 15-17.

Apparatus was developed for investigation of temperature gradients in various road surfaces and subgrades, an experiment involving continuous recording from 60 thermocouples. Readings of each thermocouple were recorded every half-hour for periods up to 100 hr. (S16)

87-S. Laboratory and Workshop Notes. *Journal of Scientific Instruments,* v. 28, Jan. 1951, p. 27-30.

Consists of the following: "An Improved Heated Cell for Infra-Red Spectroscopy," L. Brown and P. Holliday; "The Collection of Small Samples for Examination by X-Ray Powder Methods," R. Brooks and T. C. Alcock; "Rotary Film Evaporator for Laboratory Use," S. M. Partridge; "The Mounting and Centring of Specimens in High Temperature X-Ray Powder Cameras," E. G. Stewart; "The Oiling of Small Mechanisms," P. C. Smethurst; and "A Charging Device for the Fountain Pen Dosimeter," S. Eklund and L. Hedlund. (S11, M22, M23)

88-S. A Photo-Electric Temperature Controller for Multi-Point Operation. G. Mayer, D. R. Thorneycroft, and A. G. Haynes. *Sheet Metal Industries,* v. 28, Feb. 1951, p. 155-157, 166.

Equipment used for control of 12 electrically heated pot furnaces containing molten metal. (S16)

89-S. Test for the Dimensional Stability of Gauges. C. Wainwright and L. W. Nickols. *Engineering,* v. 171, Feb. 2, 1951, p. 141-142.

See abstract under similar title from *Metallurgia,* item 61-S, 1951. (S14)

90-S. Crystal Amplifier Opens New Fields for Low-Power X-Ray Inspection. *Steel,* v. 128, Feb. 26, 1951, p. 82.

New system for high-speed, automatic X-ray inspection announced by General Electric X-Ray Corp. A semiconducting CdS crystal is the fundamental component of the system. (S13)

91-S. ASTM Committee A-1 Revises Steel Specifications, Tests. *Steel,* v. 128, Feb. 26, 1951, p. 88, 90, 93, 96, 98.

Changes in standards related to steel springs, carbon and alloy bars, pipe and tubing, bolting materials, valves, flanges, and fittings for high and low-temperature service, steel forgings, plates, structural steel, and other products. (S22, ST)

92-S. Nondestructive Testing of Engineering Materials and Parts. R. C. McMaster and S. A. Wenk. *Materials & Methods,* v. 33, Feb. 1951, p. 81-96.

Basic facts about all the available methods, and the capabilities and limitations of each. Penetrating-radiation methods; ultrasonic testing; magnetic-particle testing; penetrant methods; electromagnetic-induction tests; and tribo-electric tests. (S13)

93-S. Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry,* v. 23, Feb. 16, 1951, p. 228-231.

Recent advances in analytical chemistry. 90 ref. (S11)

94-S. Spectrophotometric Study of the Platinum (IV)-Tin (II) Chloride System. Gilbert H. Ayres and Albert S. Meyer, Jr. *Analytical Chemistry,* v. 23, Feb. 16, 1951, p. 299-304.

Part of a general study of the analytical reactions of the platinum metals. A study was made of possible interference by many cations and common reagent anions; in general, the spectrophotometric method shows greater tolerance than gravimetric methods. The method, without loss of accuracy, saves time in determination of Pt and permits use of less rigorous preliminary separations. 17 ref. (S11, Pt)

95-S. Spectrophotometric Determination of Molybdenum With Phenylhydrazine Hydrochloride. Gilbert H. Ayres and Bartholomew L. Tuffly. *Analytical Chemistry,* v. 23, Feb. 16, 1951, p. 304-308.

Determination as applied to steel analysis. The usual alloying elements do not interfere. The method is simple, rapid, and accurate; and it is applicable in a steel analysis without change in usual dissolution procedures. 10 ref. (S11, ST)

96-S. Determination of Oxygen in Zirconium Metal by the Vacuum Fusion Method. J. K. Stanley, Joan von Hoene, and George Wiener. *Analytical Chemistry,* v. 23, Feb. 16, 1951, p. 377-379.

Typical results are tabulated.
(S11, Zr)

97-S. Instrument and Control Maintenance in a Steel Mill. J. H. Cuthbert. *Instruments,* v. 24, Feb. 1951, p. 212-215; *I.S.A. Journal,* v. 7, Feb. 1951, p. 16-19.

Instrumentation of a large steel mill, and some of the problems encountered in metering, and controls. Experimentation on noble-metal thermocouple compensating lead wire.
(S16, S18)

98-S. Two New Inspection Devices. *Automotive Industries,* v. 104, Mar. 1, 1951, p. 44-45, 56.

Automatic gaging machine for cylinder bores, and an instrument for precision checking of measurements of gears and camshafts—recent additions to Ford equipment. (S14)

99-S. Automatic Controls Increase Openhearth Tonnage. A. Robinson. *Iron Age,* v. 167, Mar. 8, 1951, p. 92-96.

Summary of a recent conference held by the British Iron & Steel Research Assn. How several openhearth furnaces are safely being driven at top temperatures for a larger proportion of working time. Their roof pyrometers automatically control fuel flow, resulting in greater tonnage and some fuel saving.
(S16, D2, ST)

100-S. Report on Assignment 1: Revision of Manual. C. J. Code, chair-

man. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 596-605.

Part of Report of Committee 4 on Rail. Recommended revisions of specifications for openhearth steel rails, for quenched carbon-steel joint bars, and for heat treated carbon and alloy steel track bolts.
(S22, T23, CN, AY)

101-S. Investigation of Failures in Railroad Rails. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 605-617.

Part of Report on Assignment 2, "Conditions Affecting Service Life of Rail, Causes of Rail Failures and Other Defects," from Report of Committee 4 on Rail. 23 failed control-cooled rails from 16 railroads were subjected to laboratory examination. Distribution of fracture types and causes is tabulated. Fabrication procedures at Algoma steel mill were investigated in order to clarify causes of failures. (S21, T23, CN)

102-S. Report on Assignment 3: Rail Failure Statistics. Ray McBrian, chairman. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 617-629.

Part of Report of Committee 4 on Rail. Reports submitted by most U. S. and Canadian railways for the period up to Dec. 31, 1949, are correlated and analyzed.
(S21, T23, CN)

103-S. Report on Assignment 7: Service Tests of Various Types of Joint Bars. T. A. Blair, chairman. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 634-647.

Part of Report of Committee 4 on Rail. Progress report on stress measurement on the C. & N.W.R.R.; effect of train speed; range of dynamic stresses; and frequency of stress occurrence.
(S21, Q25, T23, CN)

104-S. Ninth Progress Report of the Rolling-Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 648-659.

Part of "Report on Assignment 8: Joint Bar Wear and Failures; Revision of Design and Specifications for New Bars and Bars for Maintenance Repairs," from Report of Committee 4 on Rail. Results of experimental work at University of Illinois. (S21, Q9, T23, CN)

105-S. Report on Assignment 9: Rail Fractures Resulting from Engine Wheel Burns, Including Effect on Repairing Such Burns by Oxyacetylene or Electric Welding. J. B. Akers. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 661.

Part of Report of Committee 4 on Rail. Brief report on work of past year. (S21, K1, K2, T23, CN)

106-S. Service Tests on the Burlington Railroad Near Fort Morgan, Colo., of Joint Bars of Different Metallurgies. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 659-660.

Part of "Report on Assignment 8: Joint Bar Wear and Failures; Revision of Design and Specifications for New Bars and Bars for Maintenance Repairs," from Report of Committee 4 on Rail. (S21, T23, CN)

107-S. Report on Assignment 10: Causes of Shelly Spots and Head Checks in Rail: Methods for Their Prevention. L. S. Crane, chairman. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 661-679.

Part of Report of Committee 4 on Rail. First section: results of service tests on the C. & O., the Pennsylvania, and the N. & W. (Appendix by R. E. Cramer is abstracted separately; see next item.)
(S21, T23, CN)

108-S. Ninth Progress Report of the Shelly Rail Stuides at the University of Illinois. R. E. Cramer. *American Railway Engineering Association Bulletin*, v. 52, Feb. 1951, p. 664-679.

Results of rolling-load and physical tests of heat treated rails. Includes tests on seven rails which were flame hardened different amounts on the rail treads. Tests on two specimens of alloy rail steel containing about 1.35% Mn, 0.90% Cr, and 0.12% V, with 0.75% C. Seven detail fractures from shelling were examined in the laboratory. A new cradle-type rolling-load machine was designed. Technique used to produce electron micrographs.
(S21, Q general, T23, CN, AY)

109-S. How to Eliminate Faulty Parts and Materials With Quality Control. Harry D. Greenwood. *Western Metals*, v. 9, Feb. 1951, p. 36-38.

Second of a series on quality control at Kaiser Steel Corp. Control over refining; foundry physical control; welding inspection; shaping operations; and procedure adjustments. (S12, S?)

110-S. Checking for Failures; Inspection by the Dye Penetrant Method. *Western Machinery and Steel World*, Feb. 1951, p. 68.

Application to swaged cable fittings. (S13)

111-S. Determination of the Iron Content of Chromium Plating Baths by the Centrifuge Method. Mara Tagliabue and Benito d'Alessandro. *Electroplating and Metal Finishing*, v. 4, Feb. 1951, p. 49-50. (Translated from *Galvano Tecnica*, v. 1, no. 1, 1950, p. 28-30.)
(S11, L17, Fe, Cr)

112-S. Radiation Pyrometry in the Steel Industry. Donald Robertson. *Mechanical Engineering*, v. 73, Mar. 1951, p. 198-202.

Clarified by diagrams and illustrations of the various types of apparatus. (S16, ST)

113-S. Pyrometry in the Nonferrous Foundry. Robert A. Colton. *Foundry*, v. 79, Feb. 1951, p. 98-100, 243-245; Mar. 1951, p. 88-89, 234-237.

First installment: the various advantages of temperature control. Second installment: the different types of instruments for measuring the temperature of molten nonferrous metals. Recommendations for care and use of pyrometers.
(S19, E10, EG-a)

114-S. Founders Object to Inspection Methods. J. W. Bryant. *Foundry*, v. 79, Mar. 1951, p. 126, 129.

Flaws in the present Naval Ordnance Specifications and more particularly flaws in the inspection system. Experiences of bronze foundries, although similar difficulties were probably encountered in other materials. (S13, E general, Cu)

115-S. Detecting Tramp Metal in Logs and Iron Ore. C. W. Clapp, *Electronics*, v. 24, Mar. 1951, p. 88-93.

Problem of detecting a spherical metal particle in an alternating magnetic field, and two practical applications of the solution—detecting bullets and shell fragments in logs partially submerged in sea water, and detecting broken drill bits and other tramp metal in highly magnetic taconite iron ore. (S10, Fe)

116-S. Methods for Testing Thickness of Electrodeposits. II. Comparison of Methods for Nickel on Steel. Harold J. Read and F. Ross Lorenz. *Plating*, v. 38, Mar. 1951, p. 255-263.

Details of thorough experimental evaluation of the Magne-gage, BNF jet-test, microscopic, stripping, and cathode-gain-in-weight methods.
(S14, L17)

117-S. The Great Flaw Hunt. *Fortune*, v. 43, Mar. 1951, p. 103-106, 108.

Variety of new methods and apparatus for nondestructive testing of metals. (S13)

118-S. A Rapid Polarographic Determination of Copper, Cadmium, and Zinc in Silver Base Alloys. E. G. Ford. *Canadian Journal of Technology*, v. 29, Feb. 1951, p. 61-65.
(S11, Cu, Cd, Zn, Ag)

119-S. Radioactive Isotopes in Industry. I. Metallurgy. *Atomics* (London), v. 2, Feb. 1951, p. 39-42.

Some of the more interesting applications. (S19)

120-S. Quality Control of Fabricated Pipework for the Oil Industry. E. P. S. Gardner. *Welding and Metal Fabrication*, v. 19, Feb. 1951, p. 59-64.

Details of American and British practice for welded pipelines.
(S12, K general, ST)

121-S. Inspection of Butt Welded Pipe Joints; The Use of Trepanners and Introscopes. *Welding and Metal Fabrication*, v. 19, Feb. 1951, p. 65-67.

Equipment and procedures. (S13)

122-S. Measurement of High Temperatures. (In French.) G. Ribaud. "Les hautes Températures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 776-800.

Different types of instruments. Range of different thermocouple materials. (S16, SG-a)

123-S. Regulation of Temperatures. (In French.) G. Bouchet. "Les hautes Températures et leurs Utilisation en Chimie, Vol. II,, (Masson et Cie., Paris), 1950, p. 801-806.

Regulation of high temperatures by means of a newly developed device using a photoelectric cell. (S16)

124-S. Regulation of the Temperature of Furnaces. (In French.) Gustave Ribaud. "Les hautes Températures et leurs Utilisation en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 1305-1321.

Various methods and apparatus other than those using an expanding wire. These include resistance thermometers, thermocouples, and optical pyrometers. Mechanical systems and electrical circuits. 19 ref.
(S16)

125-S. New AISI Steels Conserve Mn, Ni, Cr, and Mo. *Steel*, v. 128, Mar. 12, 1951, p. 116, 118.

The 80Bxx series is designed to have hardenability equivalent to the 86xx steels at the same carbon content. Ranges and limits of composition are tabulated. (S22, AY)

126-S. An Evaluation of Radiography With Particular Emphasis on Detection Methods. Carlton H. Hastings. *ASTM Bulletin*, Feb. 1951, p. 66-70.

Past trends, present status, and suggested future trends in industrial radiography. Techniques employing radiation methods for producing inspection data of greater reliability and at faster rates than now possible are suggested. (S13)

127-S. Magnaflux Inspection of Welded Storage Tanks. *Welding Journal*, v. 30, Mar. 1951, p. 233-234.

R. Schnurman discusses above paper by F. A. Upson, (Jan. 1950 issue; item 30-S, 1950). Hazards often encountered in magnetic-inspection work can be avoided by the use of a high-quality "magnetic ink" instead of the dusting of powder. In author's reply, some critical comments are made concerning the suggested procedure. (S13)

128-S. Report on Split Steam Lead at New Orleans. A. W. Rankin and W. A. Reich. *American Society of Mechanical Engineers*, Paper 50-A-75, 1950, 11 pages.

Study of a split steam lead section (1% + Mo, 0.25% V alloy steel). X-ray and magnetic-particle tests, mechanical property tests, chemical analysis, macroscopic and microscopic examination, and study of weld X-ray films.
(S13, S11, Q general, M27, M28, AY)

129-S. (Book) **Spectrochemical Analysis.** L. H. Ahrens. 346 pages. 1950. Addison-Wesley Press, Kendall Sq. Bldg., Cambridge 42, Mass. $10.00.

Spectrochemical analysis in general. Special problems in analyzing rock, ore, mineral, and soil samples, integrating new developments. Content also applies to the analysis of ceramic materials, refractories, slag, and biological ash. 22-page bibliography. (S11)

T

APPLICATIONS OF METALS IN EQUIPMENT

91-T. Simple Fittings Can Be Die Cast for Special Restaurant Equipment. *Die Castings,* v. 9, Feb. 1951, p. 19, 58.

Typical examples of Zn die castings made for automatic devices for storing and dispensing dishes in restaurants and other eating places. (T10, Zn)

92-T. Husky But Not Hefty. *Die Castings,* v. 9, Feb. 1951, p. 25-26.

Use of Al die castings in chain hoists. (T7, Al)

93-T. Low Investment Costs—High Quality Products. *Die Castings,* v. 9, Feb. 1951, p. 27-28.

Al and Zn die castings are used to produce two household items: an unusual ash tray and a garment hook of novel design. (T10, Al, Zn)

94-T. Bearing Properties of Zinc for Quiet Window Operation. Allen C. Boucher. *Die Castings,* v. 9, Feb. 1951, p. 30-31, 56.

Miscellaneous examples of die-cast Zn building hardware. (T6, Zn)

95-T. Because of High Humidity Aluminum is Preferred in These Die Castings For Use With Textile Machines. *Die Castings,* v. 9, Feb. 1951, p. 32-34, 57-58.
(T29, Al)

96-T. Calcium in Batteries Proves Superior to Antimony Alloy. *Chemical and Engineering News,* v. 29, Feb. 19, 1951, p. 665-666.

New long-life storage battery in which 0.5% Ca replaces 12% Sb. Other present and potential uses of this plentiful material. (T1, Ca)

97-T. New Technique for Obtaining Heat-Transfer Parameters of the Wall and Combustion Gas in a Rocket Motor. M. E. Ellion. *Transactions of the American Society of Mechanical Engineers,* v. 73, Feb. 1951, p. 109-114.

Test method for obtaining gas sidewall temperatures in a rocket motor in order to evaluate suitability of various alloys for rocket-motor construction. Eight alloys were studied by use of a thick-walled water-cooled nozzle into which cylindrical specimens could be inserted. A modification of this technique is suggested for measuring combustion-gas film coefficient in rocket motors. The alloys were Armco iron; SAE 1010; Types 347, 446, and 310 stainless; 61S-T Al, Type "A" Ni; Inconel X; and Cu. Oxidation characteristics were observed.
(T25, R2, CN, SS, Al, Ni, Cu, SG-h)

98-T. Metals for High-Pressure Hydrogenation Plants. G. A. Nelson. *Transactions of the American Society of Mechanical Engineers,* v. 73, Feb. 1951, p. 205-211; disc., p. 211-213.

Results of tests and data from operating plants, from which it is possible to establish practical operating limits for carbon and alloy steels for all degrees of severity of service. Additional corrosive effects by S, N_2, and CO.
(T29, K9, SG-h, CN, AY)

99-T. A Simple Means of Measuring Large Magnetic Fields. G. K. T. Conn and B. Donovan. *Journal of Scientific Instruments,* v. 28, Jan. 1951, p. 7-9.

Measurement of electrical resistance of Bi should be convenient for the above. Early use of the Bi spiral has not been continued since the resistance is erratic and unreliable. By using very thin fibers of Bi drawn down in soda glass, these difficulties are avoided and rapid, reliable, and reproducible measurements may be made. Such specimens, however, show marked anisotropy, so that resistance depends on orientation with respect to the field. By etching the glass away and winding a close coil, crystalline order is drastically reduced. 16 ref.
(T8, P16, P15, Bi)

100-T. A Review of the History, Theory and Uses of Metal-Foil Insulation. H. Manley. *Sheet Metal Industries,* v. 28, Feb. 1951, p. 161-166.

Concerned largely with Al foil, although a Pb-Sn-coated steel made by American Flange Co. is also mentioned. 14 ref. (T27, Al, CN)

101-T. Ausco's Diversified Production Facilities. Joseph Geschelin. *Automotive Industries,* v. 104, Mar. 1, 1951, p. 38-39, 55.

Facilities of Auto Specialties Manufacturing Co., Hartford, Mich., for manufacture of crankshafts, etc., for tractors and automobiles. Includes press work, impact testing of crank shafts, foundry practice, and heat treatment. (T21, AY)

102-T. Hotchkiss Announces All Light-Alloy Car. W. F. Bradley. *Automotive Industries,* v. 104, Mar. 1, 1951, p. 41, 65.

New French five-passenger, four-door sedan having a weight of 2376 lb., a wheel base of 98 in., a front-seat width of 59 in., and a rear seat width of 56 in. (T21, Al)

103-T. In Electronics Emphasis is on Magnesium for Weight Saving. *Magazine of Magnesium,* Feb. 1951, p. 2-5.

Miscellaneous applications.
(T1, Mg)

104-T. Magnesium: Metal of Tomorrow? *Bookbinding and Book Production,* v. 53, Feb. 1951, p. 38-40.

Advantages of Mg for printing-plate production. (T9, Mg)

105-T. Metal Panels Rapidly Covered 41-Story Frame of Building With Stainless Skin. *Engineering News-Record,* v. 146, Feb. 22, 1951, p. 40-41.

Two applications of light-gage steel helped speed erection of a 41-story office building in Pittsburgh. In one case, stainless steel was formed into story-high exterior-wall panels. In second, low-carbon steel was shaped into bay-length floor decking. (T26, CN, SS)

106-T. Prefab Stainless Steel Swimming Pool Assembled at Site. *Progressive Architecture,* v. 32, Feb. 1951, p. 96.
(T26, SS)

107-T. Ductile Iron Replaces Steel in Shafting. *Steel Equipment & Maintenance News,* v. 4, Feb. 1951, p. 12.

34 generator shafts over 7 ft. in length were recently produced by Cooper-Bessemer Corp. in ductile cast iron. These shafts replaced a forged steel shaft of somewhat different design. (T25, CI)

108-T. Cylinder Heads for Sleeve-Valve Aero Engines. J. Hinde. *Metallurgia,* v. 43, Jan. 1951, p. 11-14.

Considerable changes have been necessary in design and construction of the cylinder heads. Some of the problems involved in the manufacture of a fabricated two-piece head. The heads consist of a Cu alloy containing 0.45-0.80% Cr, plated with Ni. To this base is brazed a fin pack of Cu. Details of plating solution and conditions and of cleaning and pretreatment. Plating is followed by a diffusion heat treatment and inspection. Finally, the base is brazed into a steel body.
(T21, L17, J general, K8, Cu, Ni, ST)

109-T. Magnesium in Photo-Engraving and Printing. *Light Metals,* v. 14, Feb. 1951, p. 82-89.

Present status in the U. S.
(T9, Mg)

110-T. Duralumin H. Shuttering—Progress Report. *Light Metals,* v. 14, Feb. 1951, p. 92-93.

"Shuttering" is apparently a British term for the forms used in concrete work. Walls up to 12 ft., 6 in. high have been successfully poured.
(T26, Al)

111-T. Application of Aluminum in Television. (In French.) Maurice Victor. *Revue de l'Aluminium,* v. 27, Dec. 1950, p. 469-472.
(T1, Al)

112-T. Furnaces With Metallic Resistance Elements. (In French.) **I. Properties and Application of Stainless and Refractory Alloys. II. Commercial Alloys for Elevated-Temperature Applications. III. Construction, Operation, and Pyrometric Control of Electrical-Resistance Furnaces.** Pierre Chevenard and Xavier Waché. **IV. Furnaces With Platinum or Iridium Resistors.** Pierre Fleury and Louis Hackspill. **V. Furnaces With Molybdenum or Tungsten Resistors Protected Against Oxidation.** Louis Hackspill. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 225-307.

Descriptive reviews. 88 ref.
(T5, S16, SS, Pt, Ir, Mo, W, SGg-h)

113-T. Furnaces With Carbon Resistors. (In French.) Georges Chaudron and Léon Moreau. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 308-352.

Comprehensive review, including structure; physical and chemical properties of amorphous carbon and graphite; preparation of electrodes; utilization in electric furnaces; details of a wide variety of furnace designs; and applications of such furnaces. 79 ref. (T5, C)

114-T. Furnaces With Ionized Conductors. (In French.) J. L. Andrieux. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 375-446.

Comprehensive review of two broad types: those utilizing fused-salt electrolysis and those with salt baths. Details of construction of a wide variety of types. Separate subsections are devoted to recovery of various metals and their alloys from their compounds by electrolysis. 375 ref. (T5, C23, J2)

115-T. High-Frequency Furnaces. (In French.) G. Ribaud. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 447-488.

High-frequency theory and its practical application in various industrial fields. Operating characteristics and different types. 26 ref.
(T5)

116-T. Arc Furnaces. (In French.) A. Damiens and A. Morette. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 489-537.

A comprehensive review, covering theory, operating practice, furnace design, and applications. Principal results obtained by research using arc furnaces. 275 ref. (T5)

117-T. Dielectric-Loss Furnaces. (In French.) Maurice Descarsin. "Les hautes Températures et leurs Utilisa-

tions en Chimie, Vol I" (Masson et Cie., Paris), 1950, p. 626-649.

Theory and practice. Includes circuit and structural diagrams. Application to various commercial purposes. 11 ref. (T5)

118-T. Electric Furnaces Operating Under Pressure. (In French.) M. Picon. "Les hautes Températures et leurs Utilisations en Chimie, Vol. I" (Masson et Cie., Paris), 1950, p. 650-686.

Different types and their theoretical bases. Fields of application. 46 ref. (T5)

119-T. Furnaces for Heating in a Vacuum or in an Inert Atmosphere. (In French.) Georges Chaudron and Léon Moreau. "Les hautes Températures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 687-755.

Existing types, their structural and operational characteristics and fields of application. 72 ref. (T5)

120-T. Radiation Furnaces. (In French.) Henri George. "Les hautes Températures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 756-775.

Theoretical bases and design of electrical radiation furnaces, usually with graphite radiation units. Particular fields of application. 17 ref. (T5)

121-T. Selection of Sintered Carbide Cutting Tools. *Steel*, v. 128, Mar. 12, 1951, p. 113, 116, 118.
(T6, C-n)

122-T. Highlights of AREA Research Activities. G. M. Magee. *Railway Age*, v. 130, Mar. 12, 1951, p. 58-61.

Work of past year has included studies on shelly rail, failures in rail and joint bars, tie wear, train speeds on curves, impact on bridges, fatigue of wood stringers, and roadbed stabilization. (T23, ST)

123-T. Carbide Proving Ground. *Wood*, v. 6, Mar. 1951, p. 18-19.

Saw grinding savings in labor amounted to $109; production is up 5% at Red Lion Cabinet Co. Cutterhead grinding savings were $188 yearly and stock savings amounted to $30 daily. (T29, T6, C-n)

124-T. Data on Stainless Steel Store-Front Design. Richard E. Paret. *Progressive Architecture*, v. 32, Mar. 1951, p. 93-97.
(T26, SS)

125-T. Interchangeable Die Cast Parts Modernize Line of Microscopes. *Die Castings*, v. 9, Mar. 1951, p. 26-28, 62.

Bausch & Lomb Optical Co., Rochester, N. Y., has replaced a number of sand-cast and stamped parts with Al and Zn die castings.
(T8, Al, Zn)

126-T. Chrome Plating on Aluminum Opens New Fields. *Die Castings*, v. 9, Mar. 1951, p. 30-32.

Use of Cr-plated Al die castings in stringed instruments to replace the traditional wood. (T9, L17, Al, Cr)

127-T. Selection of Gear Materials. C. R. Austin. *Machine Design*, v. 23, Mar. 1951, p. 157-160.

Results of studies of gear-tooth surface stresses under specified contact conditions based on investigations of Meehanite metal.
(T7, Q25, CI)

128-T. High Temperature Service With Austenitic Steels. M. E. Holmberg. *Petroleum Processing*, v. 6, Mar. 1951, p. 256-261.

Experience in the petroleum-refining industry shows there are other factors besides tensile, creep, and stress-rupture to consider. In many applications there is no advantage in using stabilized grades. A spheroidizing heat treatment is generally effective where stabilized steel is required. Low thermal conductivity and high coefficient of expansion are responsible for many of the failures, especially where thermal shock and thermal fatigue are involved. (T29, Q general, AY, SS, SG-h)

129-T. A New Metal for Farm Tool Components. H. L. Geiger and H. W. Northrup. *Agricultural Engineering*, v. 32, Mar. 1951, p. 143-147.

Refers to ductile cast iron. Properties, microstructure, and agricultural applications. (T3, CI)

130-T. Aspects in the Design and Manufacture of Planar Grids for Triodes at U.H.F. W. J. Pohl. *Electronic Engineering*, v. 23, Mar. 1951, p. 95-99.

Calculation of maximum wire length; a method of measuring residual wire tension; mesh grids; manufacture by electrical resistance welding; and design of ring grid frames. Materials are usually tungsten or molybdenum.
(T1, K3, W, Mo)

131-T. Durability of Aluminium and Its Alloys—The Food Industry. *Light Metals*, v. 14, Feb. 1951, p. 97-102.

Suitability of Al when exposed to those forms of chemical attack encountered in the food, brewing, dairy, and allied industries. (To be continued.) (T29, R5, Al)

132-T. Aluminium Survey Vessel "Ain-Al-Bahr." *Engineering*, v. 171, Feb. 16, 1951, p. 188-189; **Survey Launch "Ain-Al-Bahr."** *Engineer*, v. 191, Feb. 23, 1951, p. 260-262.

A 60-ft. cabin cruiser. Details of construction and design. (T22, Al)

133-T. (Book) **Les hautes Températures et leurs Utilisations en Chimie. (High Temperatures and Their Utilization in Chemistry.)** 2 vols. P. Lebeau and F. Trombe, editors. 1397 pages. 1950. Masson et Cie., 120 Blvd. St.-Germain, Paris 6, France.

Consists of 36 articles by 32 different French scientists covering various types of furnaces, their control, and various refractory metallic and nonmetallic materials used in construction of such furnaces. Individual articles of metallurgical interest are separately abstracted.
(T5, S16)

43-V. Aluminium and Its Alloys in 1950. E. Elliott. *Metallurgia*, v. 43, Feb. 1951, p. 69-72.

Some aspects of research and technical progress. 42 ref. (Al)

V

MATERIALS
General Coverage of Specific Materials

31-V. A Review of the Properties and Uses of Super-Purity Aluminium. S. M. Lawrence. *Sheet Metal Industries*, v. 28, Feb. 1951, p. 141-145.

(P general, Q general, T general, Al)

32-V. Discaloy. E. F. Losco. *Westinghouse Engineer*, v. 11, Mar. 1951, p. 50-53.

See abstract of "Iron-Base Heat Treatable Alloy Has Good High-Temperature Strength," *Materials & Methods*, item 207-V, 1950. (SG-h)

33-V. Titanium Rapidly Growing as Useful Engineering Material. W. T. Tiffin and P. C. Hoffman. *Materials & Methods*, v. 33, Feb. 1951, p. 57-59.

Reviews progress to date; present and future applications. (Ti)

34-V. Good Steel Casting Design Improves Quality and Reduces Costs. Charles W. Briggs. *Materials & Methods*, v. 33, Feb. 1951, p. 68-71. (Adapted from "Fundamentals of Steel Casting Design", Steel Founders' Society of America; and Chapter IV, "Steel Castings Handbook".)

Inherent characteristics of steel castings; preventing hot spots; strength considerations; section thickness; dimensional tolerances.
(CI)

35-V. Developments in High-Temperature Metals and Ceramics. Hans Thurnauer. *Electrical Manufacturing*, v. 47, Mar. 1951, p. 82-85, 230, 232.

Properties and applications of various compositions. (SG-h)

36-V. Iron and Steel. G. E. Speight and D. J. D. Unwin. *Reports on the Progress of Applied Chemistry*, v. 34, 1949, p. 94-120.

A general review. 115 ref.
(Fe, ST)

37-V. Non-Ferrous Metals; Physical Metallurgy. D. W. Wakeman. *Reports on the Progress of Applied Chemistry*, v. 34, 1949, p. 121-138.

Physical and mechanical properties, melting, coating, corrosion, and protection. 193 ref. (P general, EG-a)

38-V. Pure Hafnium Arrives. *Chemical Industries Week*, v. 68, Mar. 3, 1951, p. 19.

First commercial production of pure Hf metal by Foote Mineral Co. Present and potential applications. (Hf)

39-V. Flat Rolled Stainless Steel. John L. Cotsworth. *Canadian Metals*, v. 14, Feb. 1951, p. 10-13, 45-46.

Elementary explanations of metallurgy, standards, melting, hot rolling, annealing, and pickling, cold rolling, and polishing. Recommended user specifications. (S22, SS)

40-V. Notes on Magnesium Alloys. F. A. Fox. *Engineer*, v. 191, Feb. 2, 1951, p. 148-150; Feb. 9, 1951, p. 180-182.

First installment: production, foundry practice, and mechanical properties. Extrusions and forgings and their mechanical properties. Part II: heat treatment, fatigue properties, surface protection, and applications. (Mg)

41-V. Manganese Steels. (In French.) Etienne Sautereau. *Fonderie*, Dec. 1950, p. 2299-2301.

Method of production, chemical composition, mechanical properties, and optimum heat treatment of Mn steel containing 12-14% Mn, 1-1.4% C, 0.4-1.0% Si, less than 0.06% S, and less than 0.1% P. To increase fatigue strength, addition of 1-2% Cr or about 0.9% Mo is proposed.
(Q7, AY)

42-V. Highly Refractory Metals, Alloys, and Metallic Compounds. (In French.) M. Oswald. "Les hautes Températures et leurs Utilisations en Chimie, Vol. II" (Masson et Cie., Paris), 1950, p. 1218-1258.

A comprehensive review indicating composition, chemical and physical properties, and fields of application. 122 ref. (EG-d, SG-h)

Fellowships at Illinois Tech

Two new fellowships in metallurgical engineering have been established at Illinois Institute of Technology by the International Nickel Co., Inc. Each of the fellowships provides for two years' study leading to a Master of Science degree in metallurgical engineering, and carries an annual award of $1500 and tuition.

Purpose of the program, to begin in September 1951, is to stimulate work in the fields of nickel, copper, and the platinum metals. The awards will be based on personal qualifications, interest, and scholarship.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

SALESMAN: Nationally known steel distributor has opening in western New York for salesman 25 to 35 with some experience or training in metallurgy. Sales or mill experience desirable. Give qualifications, education, experience and enclose photo. Box 4-5.

PHYSICAL METALLURGIST: Recent graduate trained in physical metallurgy for an opening in the research laboratory of a large manufacturer of alloy, tool and stainless steels. Some training in X-ray diffraction desirable. In reply provide usual details including draft status and salary expected. Box 4-10.

TECHNICAL EDITOR: Graduate metallurgical or mechanical engineer, well-versed in metals and their fields of application. To edit ferrous and nonferrous metals and alloys articles, meet with executive engineers to discuss materials problems, gather material and write original articles. Some traveling involved. Must have proven ability to write, or qualifications to train for writer. Some industrial experience desirable. Salary commensurate to ability and experience. Box 4-15.

MANY LINES OF WORK are included in opportunities offered by one of the largest commercial heat treating and consulting organizations in the eastern United States. Some of the more important are supervisors, metallurgists, heat treaters, technicians, inspectors, quality control men, production men, maintenance men, engineers and salesmen. Letter of application should indicate training, experience, intelligence, industry, dependability, initiative, and ambition. Box 4-105.

West

FERROUS METALLURGIST: Thoroughly experienced in all phases of cold forming and cold extrusion operations. Must be capable of setting up laboratory facilities. Excellent opportunity with large San Francisco Bay area metal fabricator. Salary in proportion to ability and experience. In reply state age, training, experience and availability. Box 4-20.

Midwest

SALES ENGINEER: Required by expanding Cleveland manufacturer's agent. Chief products steel and alloy fabrications for materials handling, heat and corrosion resistance. Require graduate engineer 25 to 30. Must have good car and be willing to travel occasionally. Salary plus incentive. Reply in detail with photo. Box 4-25.

ENGINEERS: Immediate openings for several young (25 to 27), single, mechanical, technical or metallurgical engineers with sales aptitude. Opportunity to work directly with head of established manufacturer of chemicals and equipment in customer and prospect contact and service. Give complete information including training and experience. Employment will be east of Mississippi River. Box 4-30.

WANTED

metallurgist

with training and experience in physical metallurgy and mechanics for exploratory research and new development work.

B-W CENTRAL RESEARCH LABORATORY
Borg-Warner Corporation
Bellwood, Illinois

CHEMIST: Experienced openhearth or electric furnace chemist to take charge of laboratory controlling electric steel melting in new shop in Chicago area. Must have thorough knowledge of wet analysis methods. Fundamental knowledge of electronics is desirable to assume supervision of direct-reading spectrometer. Box 4-35.

RESEARCH METALLURGIST or CHEMIST: For work on program in residual stress measurements. Requires either thorough knowledge of elastic behavior of metals or stress corrosion. Experience desirable. Write: Personnel Dept., International Harvester Co., Manufacturing Research, 5225 So. Western Blvd., Chicago 9, Ill.

METALLURGIST: For nonferrous extrusion mill control and development work. College degree desired but not necessary. Must have experience. Salary open. Chicago area. State full particulars in first letter. Box 4-40.

RESEARCH ENGINEER: With degree in mechanical engineering, for product testing and development work. Testing concerned mainly with studies of wear and failure of ferrous metals. Box 4-110.

METALLURGIST or heat treat supervisor with practical heat treat experience. For manufacturer of heavy machinery. Excellent opportunity for advancement both in engineering and managerial fields. Location 54 miles from Chicago. Box 4-115.

Civil Service

METALLURGIST: CHEMIST, PHYSICIST, MATHEMATICIAN, and ELECTRONIC SCIENTISTS: Several positions open in each field of several departments of the Federal Government and at various locations in the East. Rating and pay depending on experience and education, minimum being four years of college or the equivalent. Apply: U. S. Civil Service Commission, Washington 25, D. C.

AERONAUTICAL RESEARCH INTERN: Examination announced for filling positions in science and engineering in various field laboratories and stations of the National Advisory Committee for Aeronautics. Good opportunity for research-minded graduating students with training in physics, chemistry, electronics, metallurgy, or various branches of engineering. Applicants must have completed four-year college course with major study in appropriate field of work. Apply: U. S. Civil Service Commission, Washington 25, D.C.

POSITIONS WANTED

METALLURGIST: Ph. D. in metallurgy this summer. 30 years old, veteran, three children. Plant metallurgist 2½ years in nonferrous casting, rolling, extruding and forging. Four years assistant professor of metallurgy while working on doctorate. Thesis on light metal castings. Desires responsible position in research and development in any metallurgical field; educational, or technical writing position considered. No geographic preference. Box 4-45.

CHEMICAL and METALLURGICAL ENGINEER: Combined graduate degrees, University of Michigan. Three years experience in chemical processing. Nine years in metallurgical research and development of unusual metals, other materials. "Hot -press" fabrication techniques, powders. Working knowledge of mining, plant design, construction supervision and electronics. South, southwest locations preferred. Married, age 37, family. Box 4-50.

METALLURGIST: B. S. Chemical Engineering. Married, age 37, three children. Thirteen years plant metallurgist on development and shop problems, last five years supervisory. Capable of planning and directing a laboratory or foundry. Well-versed in metal fabrication, heat treatment, corrosion and metal finishing. Wide interests in all metals and processes. East preferred. Box 4-55.

METALLURGIST: M. S. Age 34. Thirteen years experience in heat treatment, chemical and metallurgical laboratory control, rolling mills. Experienced in metallographic work. Presently in charge of hardening shop and laboratory in automobile concern in India. Desires work as assistant research metallurgist in automobile concern. Box 4-60.

PRODUCTION or FIELD ENGINEER: Familiar with alloy steels and tool steels. Now employed by leading alloy steel producer. Experience includes processing, development, and customer service. Degree in metallurgy. Age 35, married. Interested in a bona fide position of responsibility. Minimum salary, $8000. Box 4-65.

NONFERROUS MATERIALS ENGINEER: Sc.D. metallurgical engineering. Age 46. Formerly chief of chemical, metallurgical and spectrographic laboratories. Twenty years experience in all common alloys from scrap/dross source through ingoting (smelting, refining, alloying), to casting (sand, permanent-mold, die casting), to fabrication (forming, powder metal, soldering), to plating and final service performance. Specifications, substitutions, sales development. Box 4-70.

HEAT TREATING or WELDING FOREMAN or SALES: Six years experience in handling diversified welding problems such as production layout and methods. Three years of metallurgy; knowledge of all types of metal treatment. Age 31, married. Presently employed as heat treat and weld.ng foreman. Interested in position with future. Box 4-75.

SENIOR RESEARCH AND DEVELOPMENT METALLURGIST seeks opportunity to expand responsibilty. Prepared to supervise metallurgical section, act as assistant director of research in large company, or full responsibilty in smaller one. Background includes success in research, development, production in powder metallurgy, refractory metals, aircraft, welding industries. Will go anywhere for right job. About $8500. Box 4-80.

CHIEF METALLURGIST: Age 39, married; 17 years experience with large manufacturer of heavy machinery of all types, familiar with all phases of machinery fabrication. Desires position offering better remuneration and reasonable prospects of administrative work. Box 4-85.

MATERIALS ENGINEER or works metallurgist: Graduate metallurgical engineer, veteran; five years metallurgical experience in instrument and motor manufacture. Broad experience in factory supervision, specification writing, material and process control, engineering consultant and purchasing advisor. Special emphasis on aluminum, copper and iron-base alloys of all types. West Coast preferred. Box 4-90.

FOUNDRY STUDENT: Holds B.Sc. Bombay University; six years technical work in laboratory and plant of large Indian smelting company. Presently in England, where has completed course in National Foundry College. Would like to come to U. S. as student to get practical training for six months in a nonferrous foundry and six months in a steel foundry. Box 4-95.

METALLURGIST: Has 4½ years experience in aluminum industry. Would like position in Dallas-Fort Worth area of Texas, preferably in a metal industry connected with aluminum or the use of aluminum. Box 4-100.

WANTED

"The Book of Stainless Steels"

Urgent requests are frequently received for a copy of the A.S.M. book "The Book of Stainless Steels" (second edition), which is now completely out of print. Any owner of a copy in first-class condition who wishes to part with it for $5.00, please address: Editor, *Metals Review*, 7301 Euclid Ave., Cleveland 3, Ohio.

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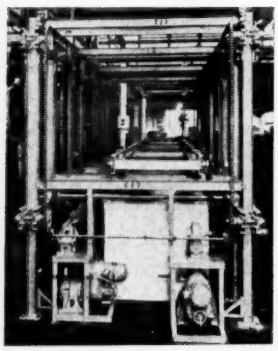

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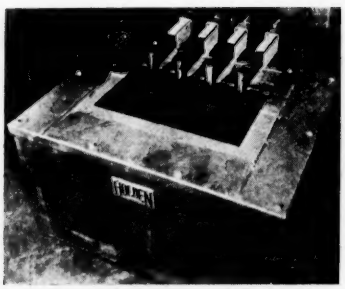

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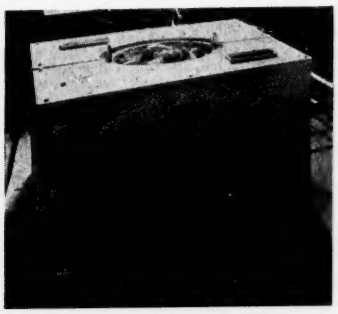

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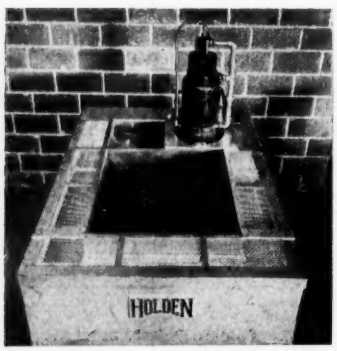

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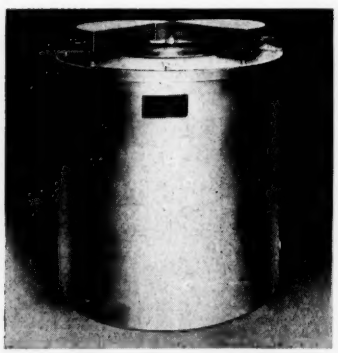

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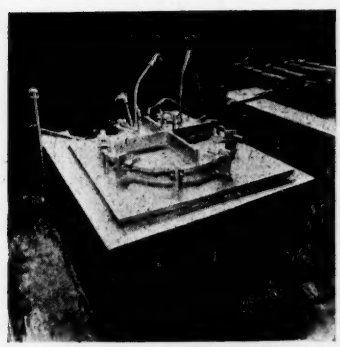

HOLDEN Liquid Nitriding Furnace

THE A. F. HOLDEN COMPANY

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